DIVISION of FISHERIES REHABILITATION ENHANCEMENT and DEVELOPMENT (FRED)

REPORT to the 1976 LEGISLATURE

State of Alaska

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introduction

Prior to 1971 the salmon research and managment program of the Alaska Department of Fish and Game was primarily directed toward obtaining and applying knowledge to regulate commercial, sport and subsistence harvests without jeopardizing future production. This program attempted to secure annual optimum escapements for each salmon species in each management area through regulation of harvests by a variety of methods.

Since Alaska has vast natural spawning and rearing areas, management based upon "optimum escapement" will yield major catches of salmon when the environment is favorable. However, poor catches are inevitable if the natural environment is unfavorable as may have occurred during the past several years.

Salmon are unique as they migrate to sea, and to a high degree, return to their river of origin or as recent data has demonstrated, to the area of release. Alaska possesses myriads of lakes and streams that are capable of producing salmon, and it is possible by developing and applying salmon husbandry to substantially increase the allowable harvest of salmon.

Furthermore, because of this homing instinct it is practical to invest time, effort, and money in projects in specific areas of the state and have the benefit (adult salmon) return to the investment area to meet needs of commercial, sport or subsistence fishermen.

Because of this, the 1971 Legislature created the Division of Fisheries Rehabilitation, Enhancement, and Development (F.R.E.D.) and charged the division with the following statutory obligations (AS 16.05.092): (1) develop and continually maintain a comprehensive, coordinated state plan for the orderly present and long range rehabilitation, enhancement and development of all aspects of the state's fisheries for the perpetual use, benefit, and enjoyment of all citizens, and revise and update this plan annually; (2) encourage the investment by private enterprise in the technological development and economic utilitzation of the fisheries resources; (3) through rehabilitation, enhancement and development programs do all things ncesessary to ensure perpetual and increasing production and use of the food resources of Alaska waters and continental shelf areas; and (4) make a comprehensive annual report to the legislature containing detailed information regarding its accomplishments under this section and proposals of plans and activities for the next fiscal year, not later than 20 days after the convening of each regular session.

After five years F.R.E.D. Division has developed much of the staff necessary to plan, review and implement the charges given the Division.

COMPREHENSIVE STATE PLAN

The Alaska Department of Fish and Game is in the process of developing an integrated statewide fisheries plan. F.R.E.D. Division personnel have contributed to the initial phases of this comprehensive plan. In addition to the overall plan, F.R.E.D. Division is developing an internal implementation plan for operational and proposed facilities. The latter plan will coordinate all projects related to these facilities.

The major problem facing the F.R.E.D. Division is that crash programs do not necessarily produce more fish sooner. Adequate time for planning, design, operational and evaluation procedures are essential if we are to have a reasonable expectation of early success.

During facility development many factors may be encountered that contribute to mortality of eggs, fry or fingerlings. These include equipment breakdowns, mistakes in operational procedures, inexperienced personnel and disease outbreaks.

Careful site evaluation and sound designs may prevent many of these problems from occurring. However, if sites are selected prior to careful evaluation of water quality and quantity, or facilities are constructed using untested designs, major production failures often occur.

During 1975, one project was delayed at Lake Nunavaugaluk, and the original site in Prince William Sound, Humpy Creek, was abandoned. The project at Lake Nunavaugaluk was delayed due to excessively high bids. The project has since been reevaluated, redesigned, and will be rebid.

The site originally selected at Humpy Creek was reevaluated when surveys revealed that the low flows of water at the site were inadequate to supply the necessary water for incubation of sufficient eggs for reasonable benefit/cost ratios. Consequently site selection studies were initiated during the summer of 1975 to identify sites with adequate water flows. A number of sites were located and are now being monitored for specific water flow, biological and engineering data.

Intensive site selection studies continue in preparation for the construction of three additional 15 to 20 million egg capacity pink/chum substrate incubation facilities authorized by the 1974 Bond Issue. These facilities will be located in Southeastern, in Prince William Sound, and in Southwestern Alaska.

PRIVATE ENTERPRISE

The 1974 Legislature passed an act authorizing the operation of private nonprofit salmon hatcheries in Alaska. Since then, a number of individuals and groups have expressed an interest. Prince William Sound Aquaculture Corporation and Sheldon Jackson College received assistance from F.R.E.D. personnel in developing plans for and during operations. As these and other nonprofit hatchery operators develop their programs, F.R.E.D. will continue to assist.

ENHANCEMENT, REAHBILITATION AND DEVELOPMENT PROGRAMS

The basic thrust during the past five years has been aimed at (1) developing, testing, and refining salmon husbandry technology; (2) developing, testing, and applying technology that will restore, maintain, or improve production from the natural environment; (3) establishing cost-effective programs, and (4) continuing to build a staff that is capable of launching a major rehabilitation and enhancement effort.

High levels of expertise are required of fish biologists, culturists, pathologists, virologists, geneticists, engineers, and administrators if there is to be a success in revitalizing the resource.

During 1975, a senior fisheries biologist and a senior fish culturist were added to each of the two regional staffs permitting for the first time the implementation of a quality control and intensive project review program. These personnel, when combined with project leaders and regional engineers, comprise the site investigation teams.

The 1971 Legislature also charged the division with the specific responsibility of developing and testing the feasibility of salmon substrate incubation and estuarine-saltwater rearing technology in the state. Five substrate facilities have been built and encouraging results have been obtained. Four saltwater rearing facilities are operational and positive results are being demonstrated.

LEGISLATIVE REPORT

The purpose of this report is to provide the legislature and the public an overview of F.R.E.D. Division activities. F.R.E.D. Division personnel view their activities the past five years as a mere start toward developing the vast salmon potential of the state. The question confronting the people of this state is how much time, effort and money should be devoted to developing the salmon resource potential. The recent appointment of a cross section of Alaskans to the Governor's Fisheries Council is a major step toward seeking answers to that question.

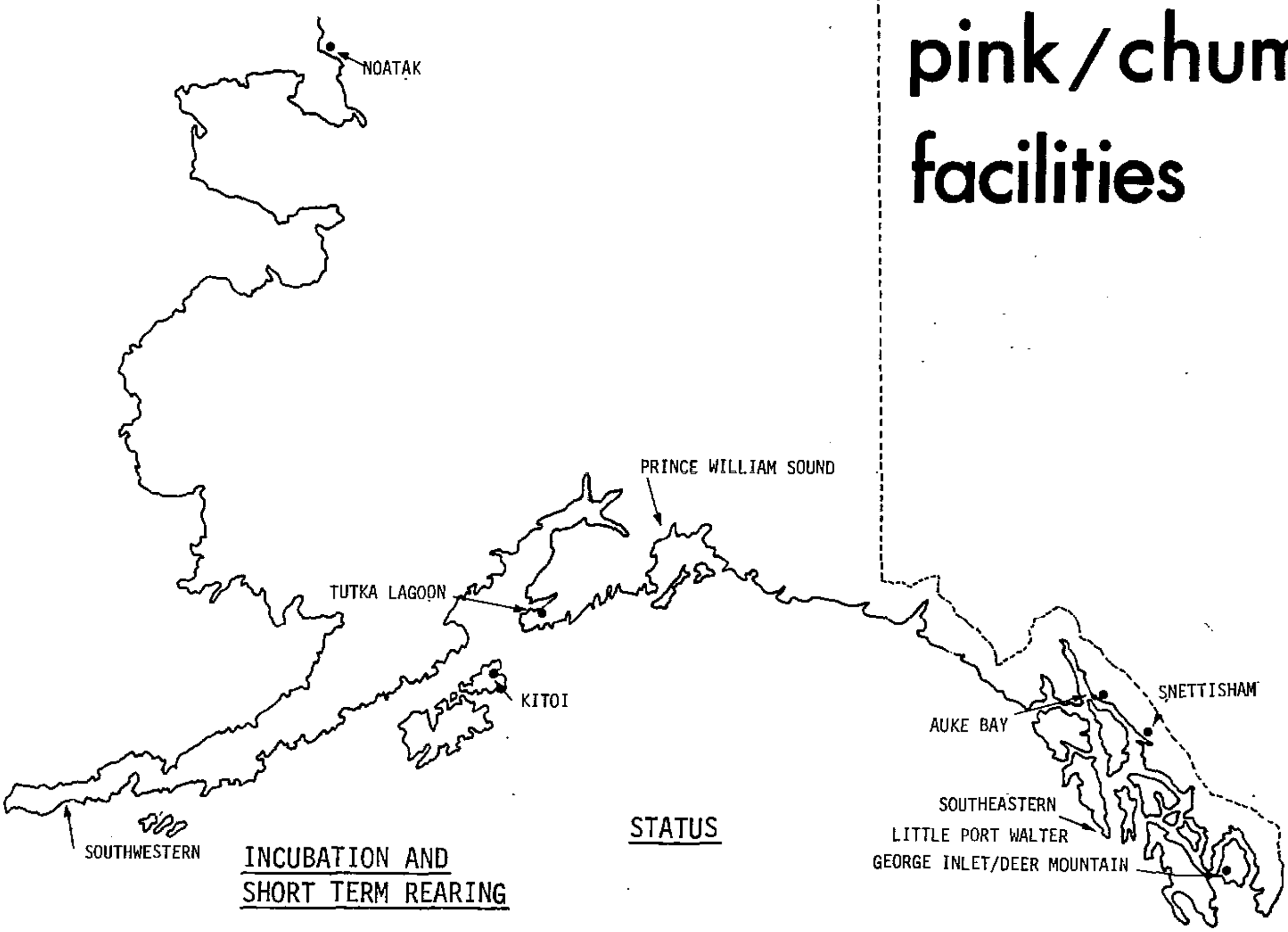
pink and chum salmon enhancement and rehabilitation

In Alaska pink and chum salmon spawn from June to October. In the spring when the fry emerge from freshwater or intertidal spawning beds, they migrate immediately to an estuarine and marine environment. Adult chum salmon return after spending two to four years in the ocean. Pink salmon adults return after about a year in the ocean.

Because pink and chum salmon are capable of adapting to the marine environment as fry, production facilities can be developed that are simpler in design and less costly to operate than those strictly artificial facilities required for long term rearing of coho and king salmon.

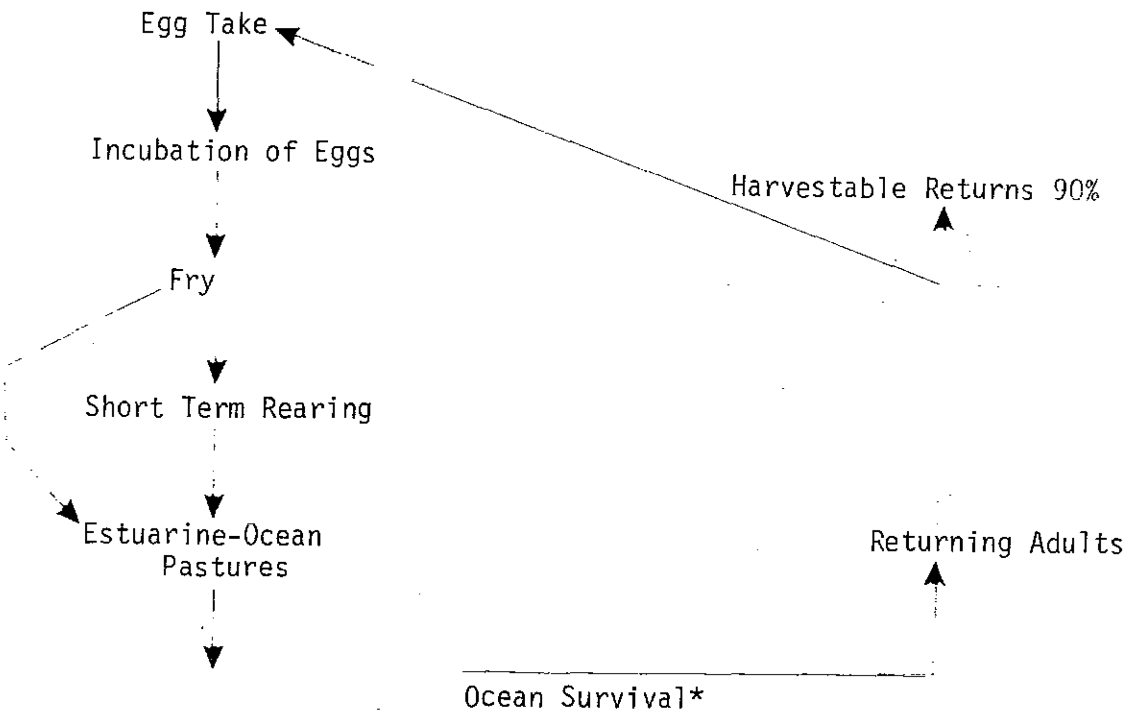
Compactness of facilities is essential in Alaska where remote construction and operational costs are high. Heating of buildings is essential in many areas of Alaska. Heat is expensive and minimizing efficiently the amount of non-fish producing space may increase benefit/cost ratios.

OPERATIONAL & PLANNED pink/chum facilities



INCUBATION AND SHORT TERM REARING	STATUS
Auke Bay	Operational 1975
George Inlet	Operational 1975
Deer Mountain	Operational 1975
Kitoi	Operational 1975
	Expansion 1976
Tutka	Operational 1976
	Expansion 1977
Southeastern	Site Investigation (1974 Bond)
Prince William Sound	Site Investigation (1974 Bond)
Noatak	Feasibility Studies (1974 Bond)
Southwestern	Site Investigation (1974 Bond)
Snettisham	Feasibility Studies
Little Port Walter	Operational 1975

PHASES OF PINK-CHUM SALMON AQUACULTURE PROGRAM



*Short term rearing facility may be used to coordinate release timing with optimum estuarine productivity and may double average ocean survival from 1 to 2%.

EGG TAKE

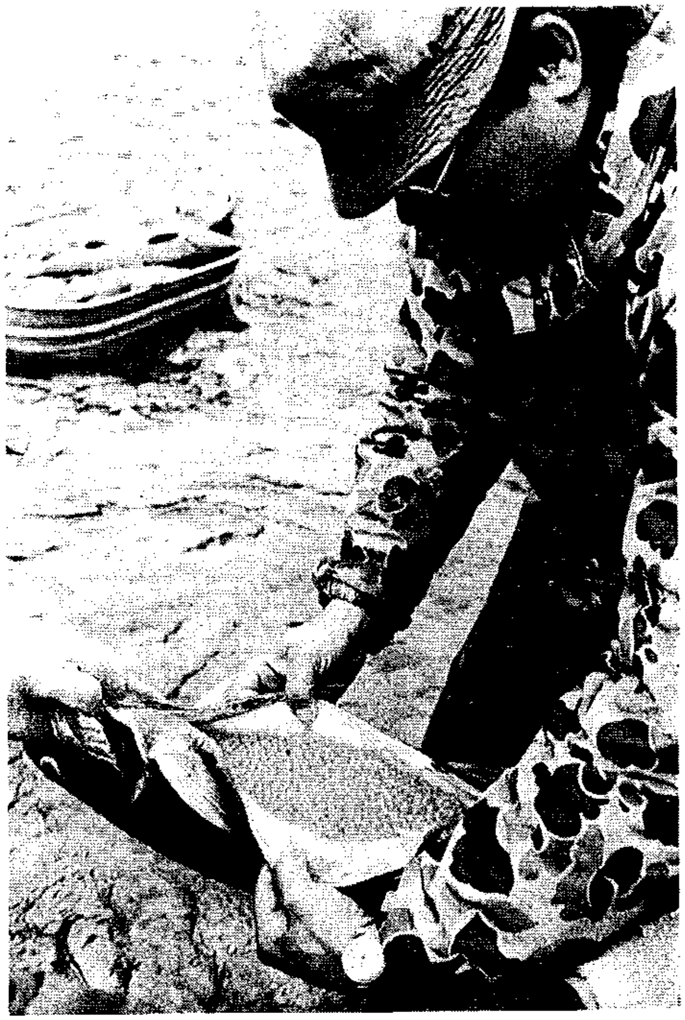
Over 9.4 million pink salmon eggs and approximately 4.8 million chum salmon eggs were taken by F.R.E.D. Division in 1975. These eggs represent a 90% increase over 1974 egg takes.

PINK AND CHUM SALMON EGGS TAKEN AND SEEDED IN F.R.E.D. SUBSTRATE INCUBATION FACILITIES IN BROOD YEAR 1975 AND PROJECTED FRY PRODUCTION THE SPRING OF 1976

Facility	Location	Species	Number of Eggs Taken	Projected Fry Production	Projected Percent Survival
George Inlet	Ketchikan	Chum	4,800,000	3,360,000	70
Deer Mountain	Ketchikan	Pink	2,000	1,400	70
Little Port Walter	Baranof Island	Pink	900,000	850,000	70
Auke Bay	Juneau	Pink	400,000	280,000	70
Crooked Creek	Soldotna	Pink	2,900,000 1/	300,000	10
Kitoi	Afognak Island	Pink	5,266,000 2/	2,820,000	70
East Creek	Dillingham	Chum	6,800	3,400	50
	TOTALS		14,274,800	7,614,800	

1/ Crooked Creek fry originated at Tutka and a portion will be returned to Tutka. Significant mortalities occurred during construction and from excessive sediment loads.

2/ 1,238,000 eyed eggs were planted in Afognak streams for transplant test.



Chum salmon eggs were taken at Disappearance Creek, Southeastern Alaska. In most cases eggs are taken and fertilized on site and transported to a substrate facility. In this case the eggs were taken to the Deer Mountain Hatchery and later transferred to the George Inlet incubator.

Photos by Pat Roppel

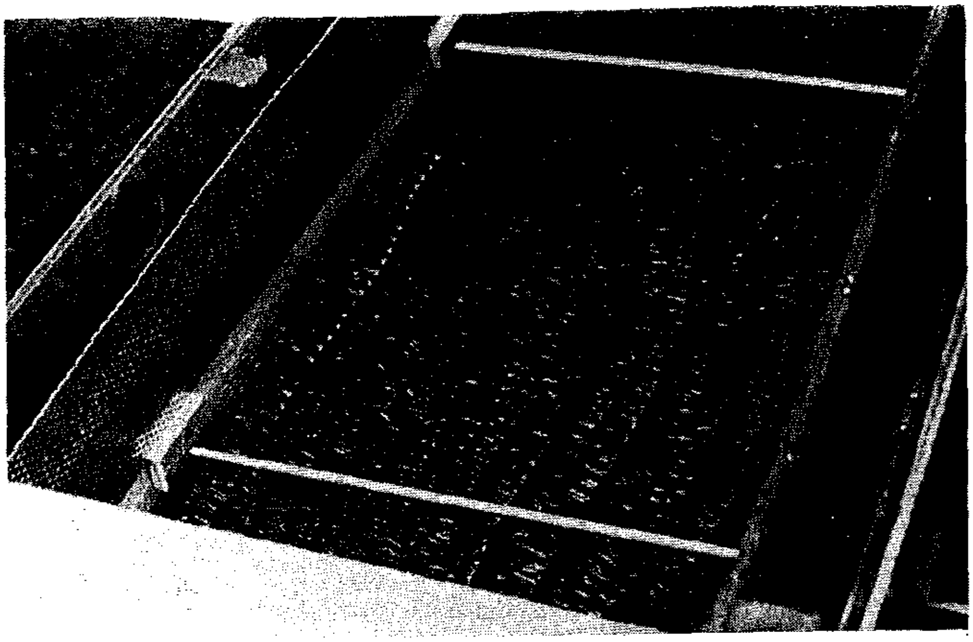
If conditions are not ideal, eggs and milt may be shipped separately in iced containers and fertilization will take place at the hatchery. F.R.E.D. Division policy requires males and females to be randomly selected and mated on a 1 to 1 basis to aid in maintenance of genetic variability.

INCUBATION

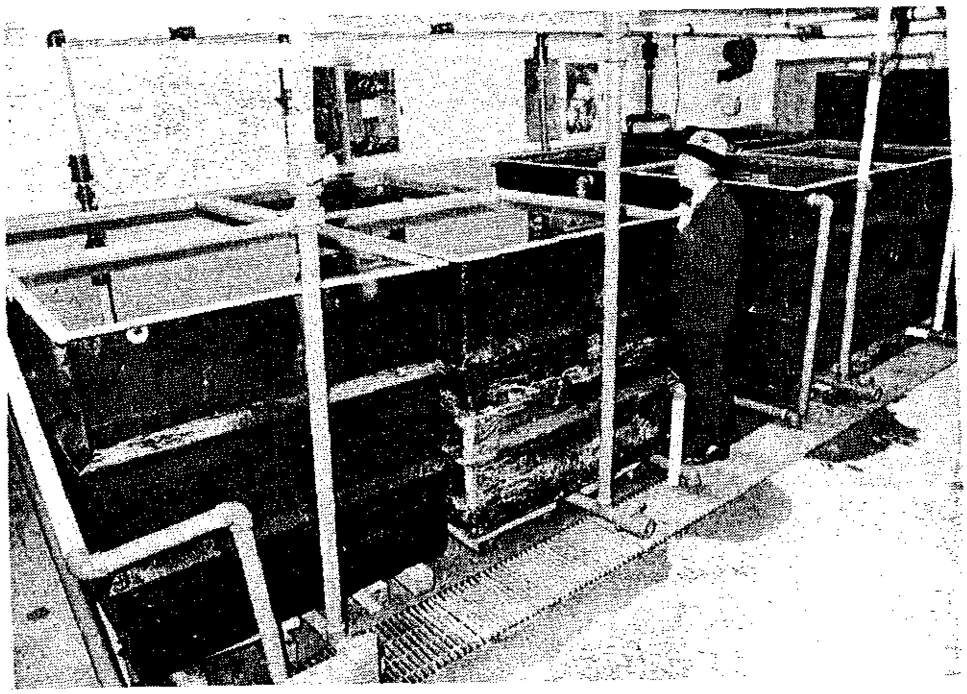
At the hatchery the eggs are incubated in an artificial substrate such as Astroturf or the natural substrate, gravel. Research is underway to determine the best substrate and incubation design. To date gravel has been found to be expensive to transport and difficult to handle. In contrast, artificial substrates have proven to be inexpensive and easy to handle. Gravel and artificial substrate technology has been refined to the point where high quality fry may be produced and resultant adult runs have occurred.

Survival of eggs to the returning adult stage produced by substrate incubators at Auke Creek Hatchery has been 5.5 to 9 times greater than eggs naturally deposited and incubated in Auke Creek spawning grounds.

Eggs are taken directly from the spawning site to a hatchery where they are incubated to the eyed stage. Once eyed, the eggs are seeded in a substrate incubator.

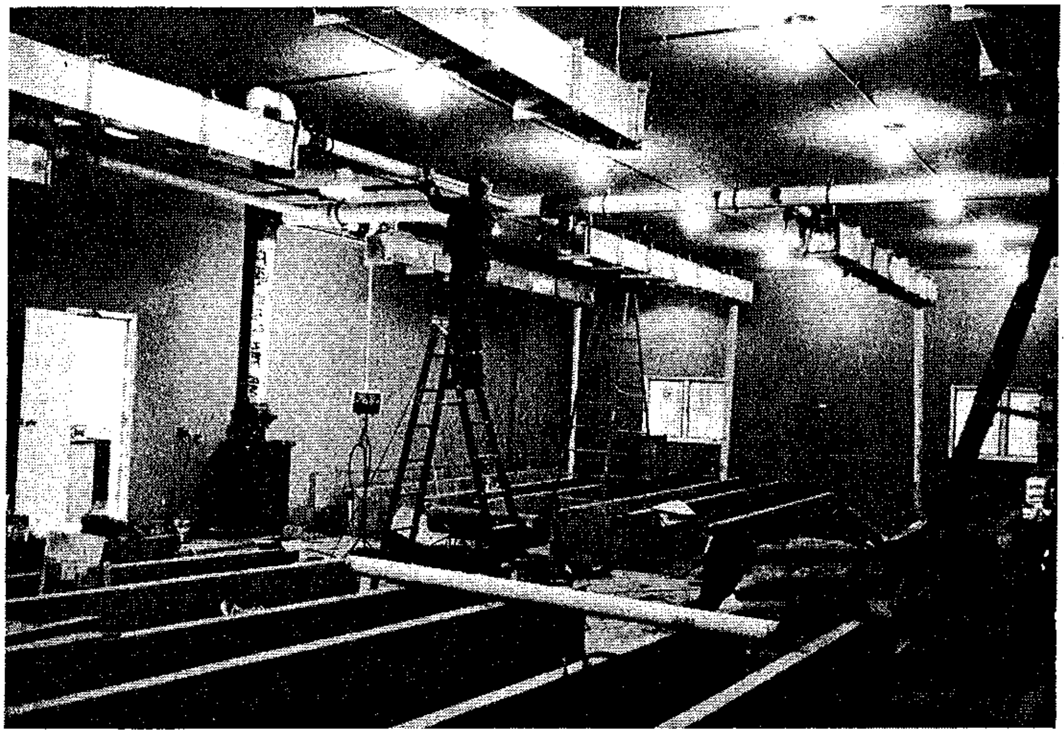


In one type of incubator vertical strips of Astroturf are placed above a perforated plate and held down by horizontal rods. Eyed eggs are seeded directly onto the Astroturf. Once the alevins hatch, they move down into the substrate.



In gravel incubation, the eyed eggs are seeded in layers throughout the gravel in large boxes. When the fry hatch, they distribute themselves throughout the gravel. Once the fry emerge they can either be released immediately into an estuarine or ocean environment or they can be short term reared.

The incubation facility at Tutka Lagoon is in the final phases of completion. It has an initial capacity of 10 million pink and/or chum salmon eggs and will be fully operational in the summer of 1976. It is projected that this incubator will produce yearly from 100,000 to 200,000 returning adults.



The Tutka Lagoon substrate incubators are positioned on top of prestressed concrete raceways. The fry, when hatched, go into the raceways for short term rearing. These raceways may also be used for longer term rearing of coho, sockeye, king salmon and trout for other programs.

SURVIVAL OF 1974 BROOD YEAR PINK AND CHUM EGGS TO THE FRY STAGE
AT F.R.E.D. SUBSTRATE INCUBATION FACILITIES

Facility	Location	Species	Number of Eggs Taken	Number of Fry Released	Percent Survival
George Inlet	Ketchikan	Chum	1,400,000	974,200	69.5
Auke Creek*	Juneau	Pink	1,400,000	1,079,000	77.1
Crooked Creek	Soldotna	Pink	2,700,000	140,000	5.1 1/
Kitoi Bay	Afognak Island	Pink	2,223,000	1,228,000	55.2
		TOTALS	7,732,000	3,421,200	44.3

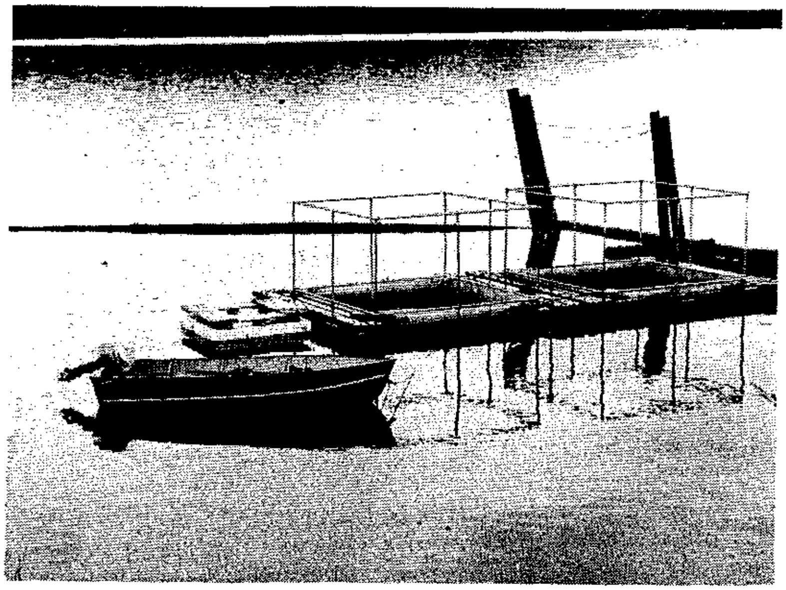
*Operated by National Marine Fisheries Service

1/ Significant mortalities occurred from excessive sediment settling on the substrate and from improper procedures used during the egg take.

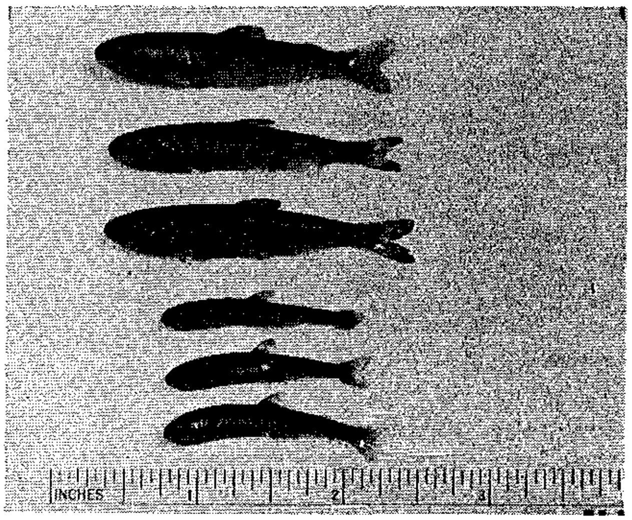
SHORT TERM REARING

Research in Japan and Alaska suggests that larger fingerlings released into the ocean at a time when natural food is plentiful have a higher survival rate. Preliminary data indicates the Japanese hatchery systems produced approximately 15 million adult chum salmon in 1975. They attribute much of their success to substrate incubation, short term rearing (20 to 40 days) and subsequent release of fingerlings when estuarine temperatures and food conditions were favorable.

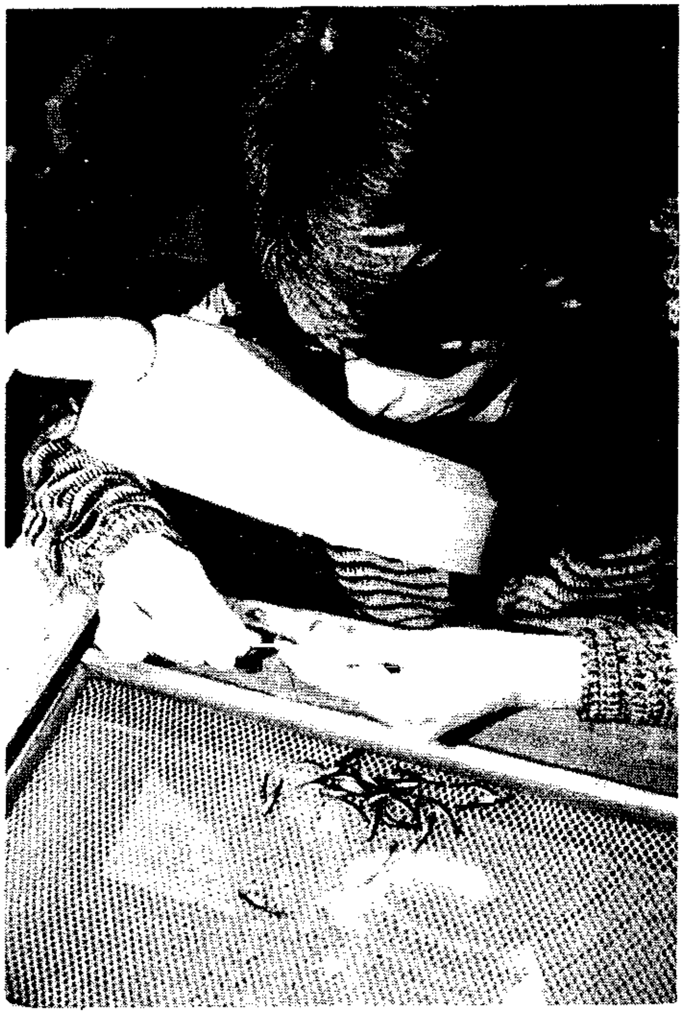
Consequently short term rearing of chum and pink fry is desirable. Saltwater rearing pens and concrete raceways are two types of short term rearing systems that are being tested.



After the fry emerge from the substrate, they may be placed directly into saltwater rearing pens such as those used at George Inlet. This rearing approach cuts down on land construction and operational costs as the tide delivers oxygen to the fish and carries away wastes. Fry are fed hourly during the daylight hours.



Chum salmon fry (lower) from substrate incubators were placed in saltwater pens at George Inlet in the spring of 1974. They averaged 1,231 fish per pound. Approximately 30 days later they averaged 407 fish per pound (upper) and were released. Survival during this rearing period was 95%.



Marking salmon fry by clipping fins before release provides a means of evaluating survival of adult fish. At George Inlet 75,215 chum salmon fry were marked for an imprinting study. The ability to imprint fry produced at a facility but originating from another stream may be a key factor in rapidly rebuilding runs.

RETURNING ADULTS

The ultimate success of a facility is measured by the adult return. Two facilities produced encouraging returns of pink salmon during 1975. Thirty-one percent of the total return to Kitoi this year was attributed to fry released from the Kitoi facility. A record pink salmon run in Auke Creek near Juneau was attributed to salmon reared in the hatchery's gravel incubation system.

Approximately 18,500 pink salmon returned to Kitoi in 1975. Fry released from the Kitoi hatchery in 1974 contributed 5,800 adults (31% of the total return) while remaining fish were produced by natural spawning in Big Kitoi Creek.

Five times as many hatchery fish as natural fish are expected to return to Kitoi in 1976 since hatchery production was increased significantly and natural production declined dramatically because of poor overwinter survival.

N.M.F.S. Photo

A record of 14,261 pink salmon returned to Auke Creek in 1975. The average pink salmon run in this creek before installation of the gravel incubators was about 2,500 fish and the high about 3,800. Runs of 6,260 fish in 1974 and 4,948 in 1973 were also attributed to salmon reared in the hatchery's gravel incubation system. The 1975 return included 1,310 marked hatchery fish from a total release of 1.3 million fry in the spring of 1974. Average ocean survival was 1.1 percent.

The Auke Bay facility is operated by a cooperative agreement with National Marine Fisheries Service and the Territorial Sportsmen.

RECENT PERCENT SURVIVAL TO THE ADULT STAGE
OF CHUM FRY AND FINGERLINGS RELEASED FROM
OREGON, WASHINGTON, AND JAPANESE HATCHERIES

Location	Brood Year	Fry	Fingerling	Percent Survival to Adults
Netarts, Oregon	1969	X		.70 1/
Nemah, Washington	1967		X	.69 2/
	1968		X	.37
	1969		X	.30
	1970		X	.41
Quilcene, Washington	1966	X		.30 3/
	1967	X		.25
	1968	X		.44
	1969	X		.58
Hoodsport, Washington	1966		X	1.63 4/
	1967		X	1.03
	1968		X	.96
	1969		X	1.85
	1970		X	3.01
Hokkaido, Japan	1966		X	2.31 5/
	1967		X	1.94
	1968		X	2.46
	1969		X	2.16

1/ Substrate incubated - escapement only - release not coordinated with estuarine conditions - assumed catch (Dr. William McNeil)

2/ Non-substrate - short term reared

3/ Non-substrate - fry release - assumed catch

4/ Non-substrate - short term reared but larger size at release than Nemah.

5/ Primarily substrate - short term rearing - release qued to estuarine conditions

Source: Mathews, Stephen B. and Senn, Harry G., "Chum Salmon Hatchery Rearing in Japan, in Washington", Division of Marine Resources, University of Washington, May 1975.

RECENT PERCENT SURVIVAL TO THE ADULT STAGE OF
PINK SALMON FRY/FINGERLINGS RELEASED
FROM ALASKAN AND BRITISH COLUMBIA HATCHERIES

Location	Brood Year	Fry	Fingerling	Percent Survival to Adults
Little Port Walter, Alaska	1973		X	2.9 1/
Little Port Walter, Alaska	1973		X	1.3 1/
Auke Creek, Alaska	1972	X		.79 2/
Auke Creek, Alaska	1973	X (early run migrants)		.17 2/
Auke Creek, Alaska	1973	X (late run migrants)		1.46 2/
Kitoi Bay, Alaska	1973	X		1.55 2/
Tsolum River, B.C.	1968	X		4.50 3/
Tsolum River, B.D.	1970	X		1.20 3/

1/ Escapement only - short term reared in saltwater pens (N.M.F.S. data)

2/ Survival of fin marked fish - mostly weir recoveries - no short term rearing (A.D.F. & G. and N.M.F.S. data)

3/ Survivals corrected for marking mortality - catch and escapement recoveries - no short term rearing (Journal of Fisheries Research Board of Canada)

coho and king salmon enhancement and rehabilitation

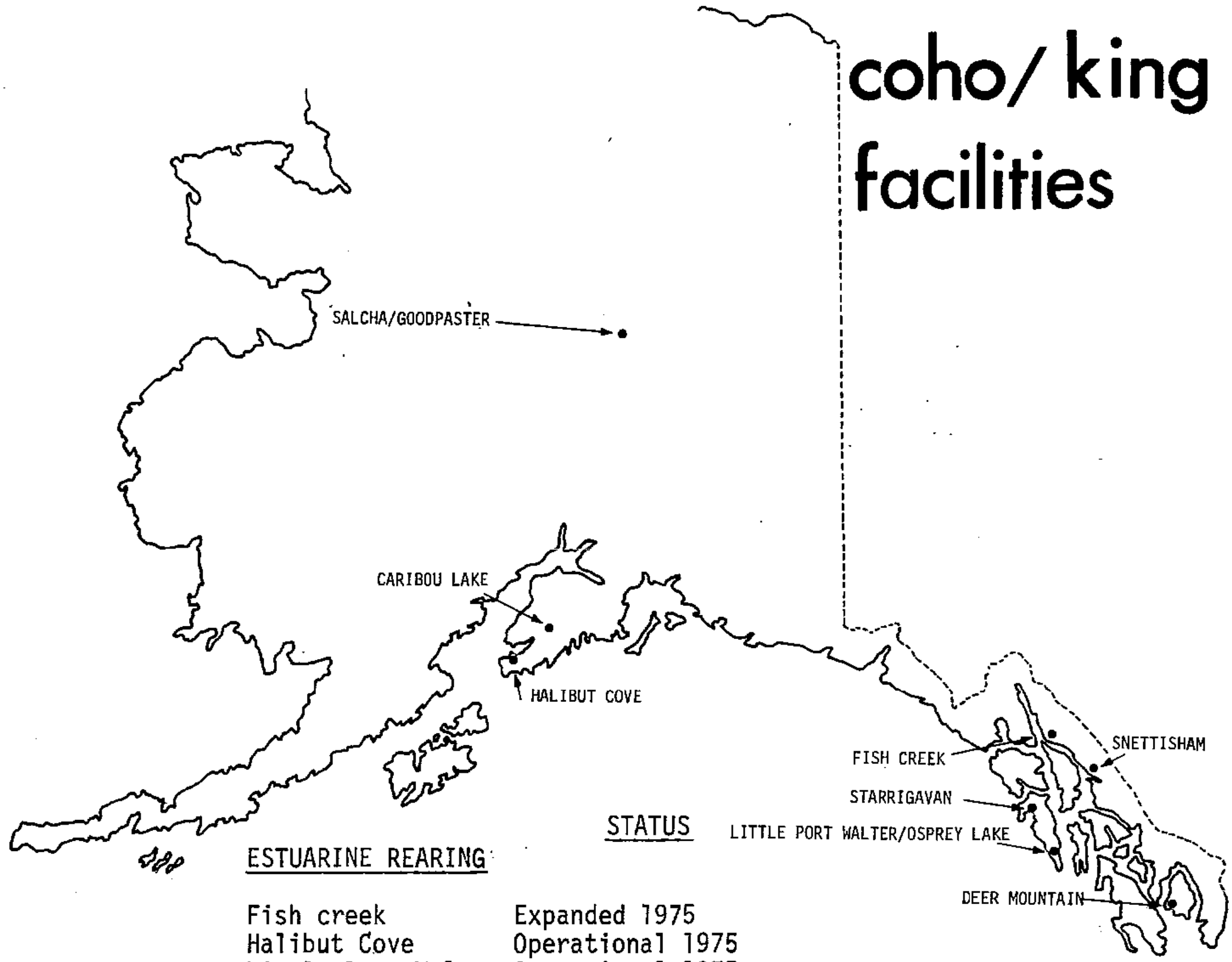
Coho and king salmon spawn in the gravel of freshwater streams. Unlike pink or chums, when the fry emerge from the gravel, the coho and king fry either stay in the stream or migrate to a lake where they rear for one, two or more years. After migrating to sea as smolts, coho rear in the marine environment about a year while kings remain at sea from two to five years before returning as adults.

Because coho and king salmon normally must become smolts prior to a marine existence, any alternative production scheme must be based on the availability of long term rearing facilities or suitable natural rearing areas.

F.R.E.D. Division has coho and king salmon estuarine facilities at Starrigavan, Halibut Cove Lagoon, and Fish Creek (Juneau). At Little Port Walter, F.R.E.D. participates in cooperative estuarine rearing research with the National Marine Fisheries Service. Studies are also underway on Baranof Island in Southeastern Alaska and in the Kachemak Bay area of Cook Inlet to evaluate coho smolt production by planting fry in underutilized lakes.

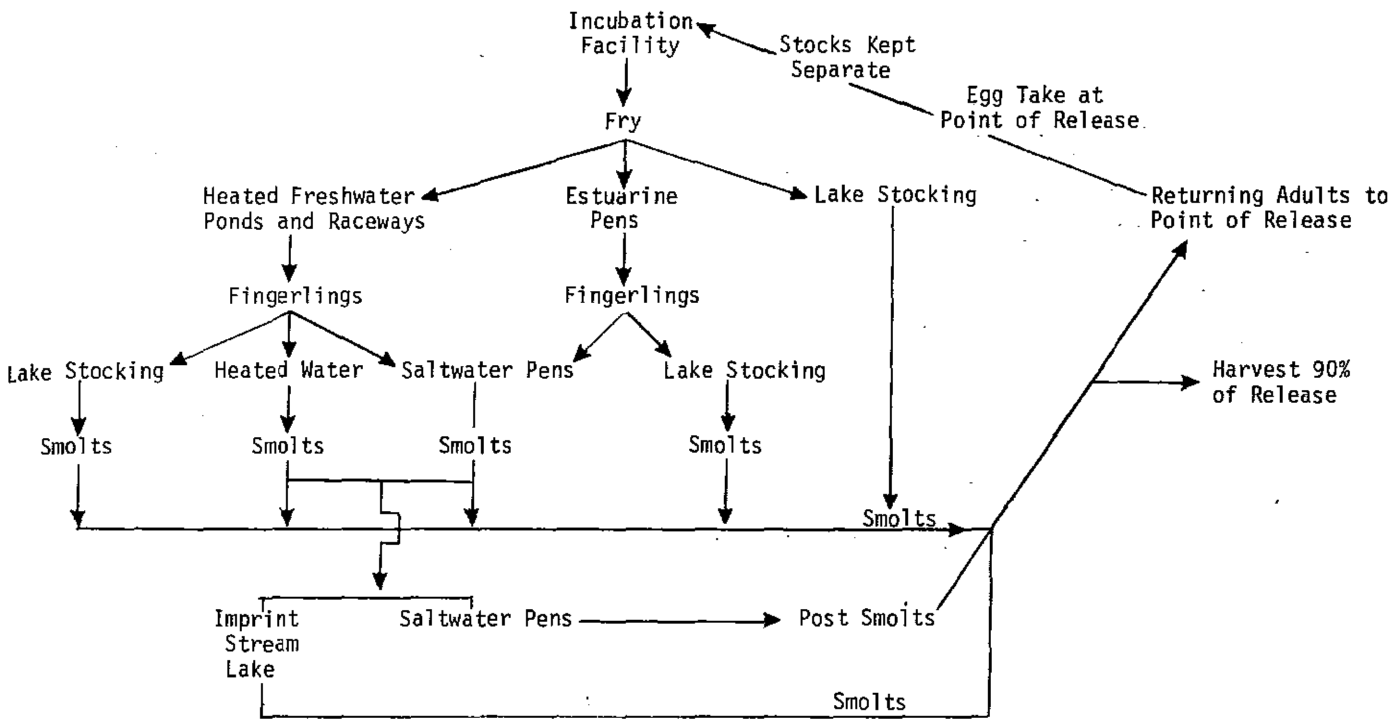
OPERATIONAL & PLANNED

coho/ king facilities



	STATUS
ESTUARINE REARING	
Fish creek	Expanded 1975
Halibut Cove	Operational 1975
Little Port Walter	Operational 1975
Starrigavan	Operational 1975
Snettisham	Feasibility Studies
INCUBATION	
Deer Mountain	Operational 1975
Starrigavan	Operational 1975
Snettisham	Feasibility Studies
Salcha-Goodpaster	Feasibility Studies
LAKE STOCKING	
Caribou Lake	Stocked 1975
Osprey Lake	Stocked 1975

OPTIONAL PHASES OF COHO-KING SALMON AQUACULTURE PROGRAM



EGG TAKE

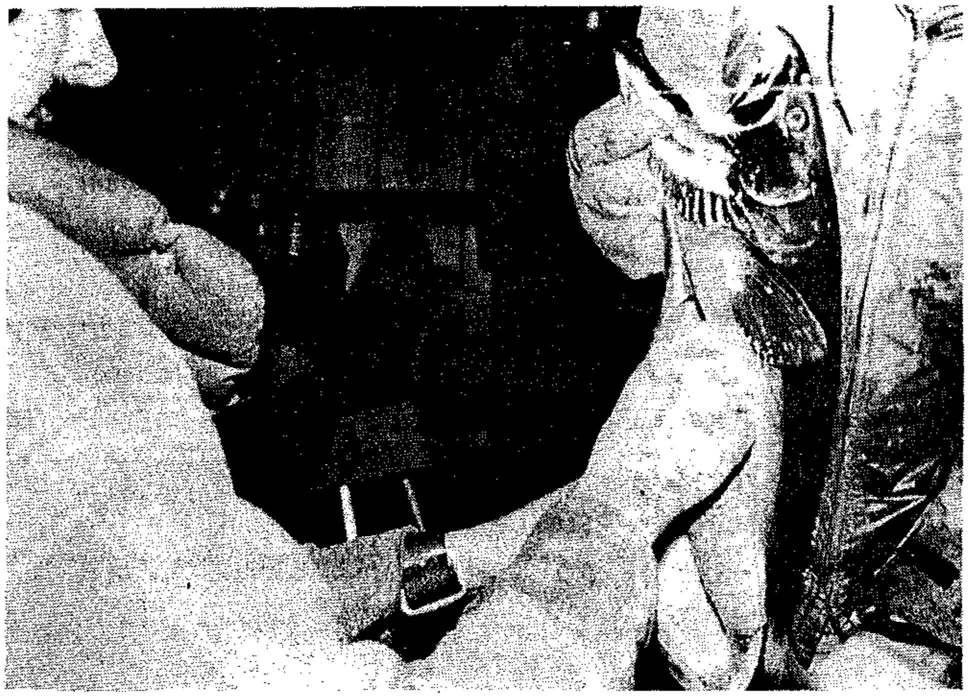
king salmon

629,400 king salmon eggs were taken by F.R.E.D. Division and associates in 1975. A brood stock for king salmon has been difficult to develop because of problems in locating sufficient numbers of adults on spawning grounds for effective egg takes.

217,200 king salmon eggs were taken from the Nakina River through a cooperative agreement with Canada to establish a brood stock in Southeastern Alaska. These eggs were placed in Crystal Lake Hatchery near Petersburg and the Auke Bay Hatchery.

coho

A total of 1.7 million coho eggs were taken by F.R.E.D. Division in 1975.



A total of 123,000 eggs were taken at Halibut Cove Lagoon from 100 coho adults which returned from a 1973 release of 7,900 post smolts. These eggs will aid in establishing a brood stock for this area and facility. Release of post smolts at Halibut Lagoon may eventually create a major fall saltwater sport fishery in Kachemak Bay.

1975 Brood Year

KING SALMON EGGS AND ALEVINS ON HAND

December 31, 1975

Facility Incubated At	Number of Eggs Taken	Source	Agency	On Hand December 31, 1975	Percent Surviva
Deer Mountain	16,000	Chickamin River	F.R.E.D.	13,000 feeding fry	81.3
Crystal Lake	177,200	Nakina River	Hatchery Section	2,600 fry 1/	1.5
Crystal Lake	43,000	Chickamin River	Hatchery Section	2,000 fry 1/	4.7
Fire Lake	328,000	Crooked Creek	F.R.E.D. Hatchery Section	105,000 fingerling	32.0
Kitoi	25,000	Chignik River	F.R.E.D. Hatchery Section	24,600 fry	98.4
Auke Creek	40,000	Nakina River	F.R.E.D. N.M.F.S.	17,000 fry	42.5
TOTAL	629,400			164,200	

1/white spot disease

1975 Brood Year

COHO SALMON EGGS TAKEN

December 31, 1975

Facility	Species	Agency	Number of Eggs Taken	Source
Starrigavan	Coho	F.R.E.D.-N.M.F.S.	1,461,700	Starrigavan & L.P.W.
Deer Mountain	Coho	F.R.E.D.	20,000	Ketchikan Creek
Little Port Walter	Coho	N.M.F.S.-F.R.E.D.	100,000	Little Port Walter
Fire Lake	Coho	F.R.E.D.	123,300	Halibut Cove Lagoon
TOTAL			1,705,000	

INCUBATION AND REARING

Once eggs are taken they are either incubated at the site, as is done at Starrigavan or may be shipped to one of the hatcheries at Crystal Lake near Petersburg or Fire Lake near Anchorage. Here they are eyed and hatched.

Since coho and king salmon reside in freshwater for one to two years, the alevins must be reared to smolt size. This can be accomplished at hatcheries, but the size of facility and cost of food becomes a prohibiting factor for producing large numbers of fish. Low cost alternatives to long term rearing are now being examined. Producing fingerlings at a reduced cost can be accomplished by any of the following methods:

1) rearing for a period in saltwater rearing pens;

2) placing in barren or underpopulated streams where they are suitable environmental niches;

3) planting in accessible lakes which have been rehabilitated to remove predators and competitors and then managed as a single species production area;

4) planting in lakes or streams above impassable barriers which may be laddered or which may be used only for freshwater rearing areas;

5) planting natural or semi-natural ponds and lagoons where fish may be fed and/or subsist on natural food.

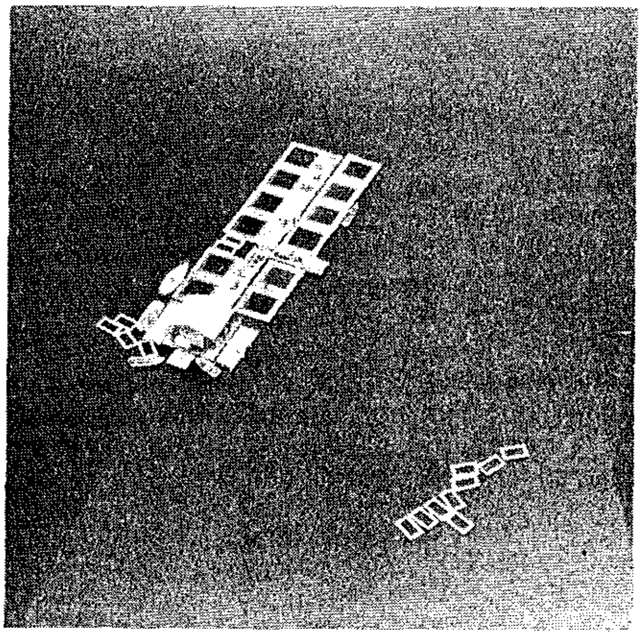
All of these methods have been or are being used successfully to produce coho and king salmon both in Alaska and other areas.

SALTWATER REARING

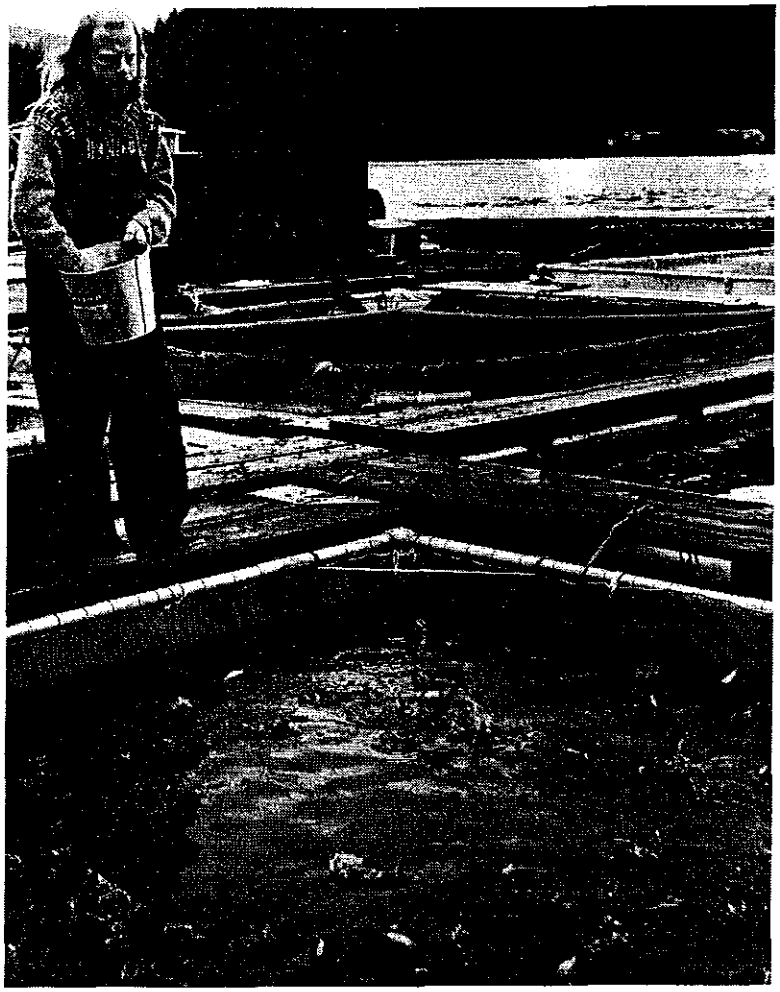
F.R.E.D. Division is determining the feasibility of fry to fingerling, fry to smolt, and post smolt husbandry in estuarine and saltwater pens as methods of enhancing salmon production. Two alternatives are currently being evaluated at the estuarine facilities: 1) short term rearing, and 2) overwintering or long term rearing.

The moderate winter conditions in Southeastern Alaska allow overwinter rearing. However, further north, the overwinter rearing concept has had to be closely evaluated. A site at Halibut Cove Lagoon was selected in Kachemak Bay where harsh environmental conditions prevail.

Halibut Cove Lagoon has experienced numerous problems because of the severe climate and a number of these problems are still to be solved. Fish are being cultured through the winter to reevaluate overwinter success. If results indicate the overwintering is unfeasible, this aspect of the project will be eliminated and emphasis placed on other alternatives. Alternative schemes would focus on non-winter rearing correlated with incubation and initial fry stage culture at other facilities like Fire Lake Hatchery.



Twelve large floating pens for rearing are available at Halibut Cove Lagoon. Each contains about 1,000 cubic feet of water. During the summer months when freshwater is available, each pen is fitted with plastic water barriers extending down one-half the pen depth. These allow salinity regulation in the upper half of each pen. The building at the lower end of the pen is used as laboratories and offices.

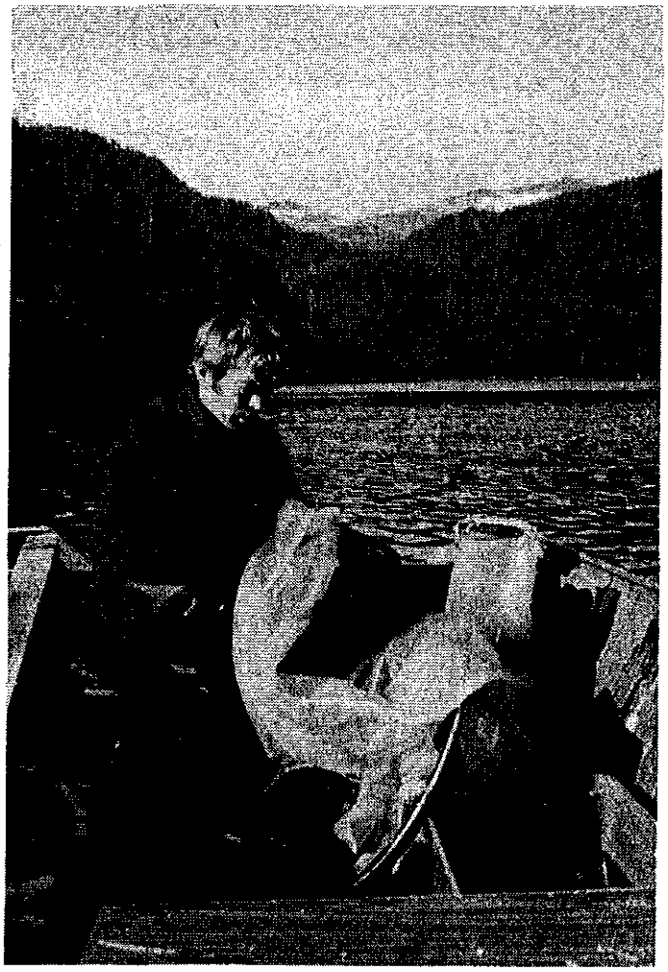


At the Starrigavan estuarine facility fry are fed until they reach smolt size which requires overwinter culturing. Smolts are then released in Starrigavan Bay.

LAKE STOCKING

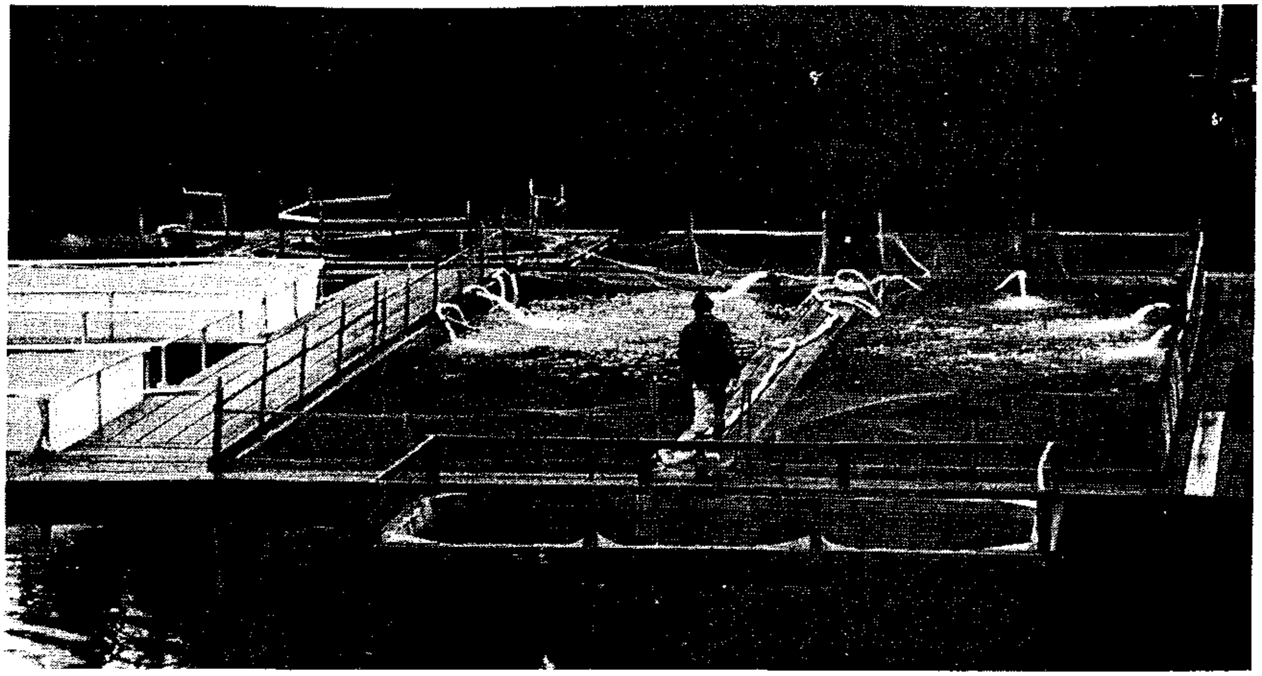
Lake stocking appears to be an excellent low cost alternative to long term rearing. Fry may be short term reared at estuarine facilities or conventional hatchery raceways and ponds, and then planted in natural lake situations. Lake productivity then supplies the necessary food until smolts migrate from the lake.

Studies at Little Port Walter have been conducted on lakes where natural barriers have excluded salmon. This has opened a whole new series of lakes for possible production. In order to develop a realistic index prior to full scale stocking programs, it is imperative that detailed studies be initiated to evaluate productivity of these lakes and their impact on a localized fishery.



Dick Crone, N.M.F.S., conpletes a plankton two as Osprey Lake to evaluate the effects of the 277,000 fry transplant on the lake productivity.

Pat Roppel photo



N.M.F.S. Photo

At Little Port Walter coho fry were short term reared in floating fabric raceways until July when they were transported to Osprey Lake. The raceways contain freshwater but float in saltwater.

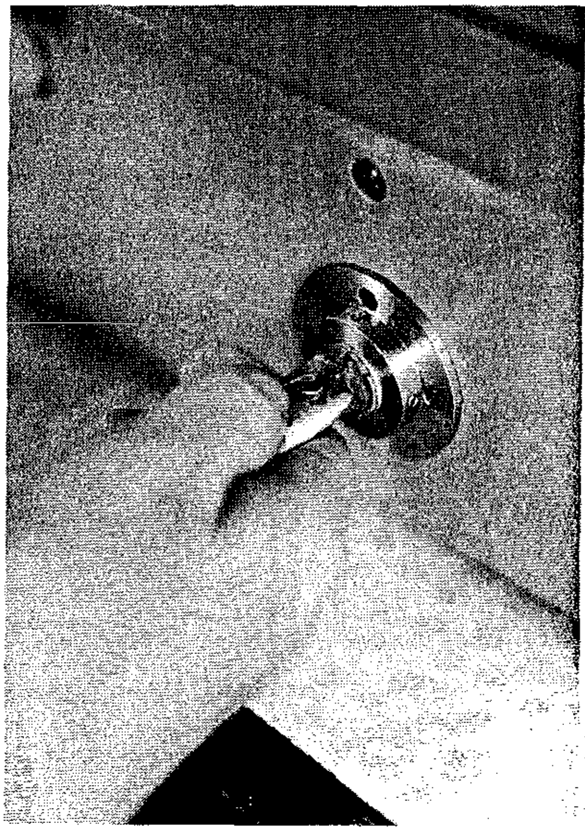
The Little Port Walter coho fry were counted by weight, then placed in custom hauling tank and flown to Osprey Lake. Fry were released throughout the lake to lessen competition and predation.

N.M.F.S. Photo

CODED WIRE TAG PROGRAM

Marking fish is an important research tool. F.R.E.D. Division has undertaken an extensive magnetic tagging program to evaluate rearing success. Smolts have the adipose fin clipped and then a coded wire tag is injected into the snout and magnetised. When adults return the tags identify when and where fish were released.

The adipose fin clip on coho is used throughout the Pacific Northwest. No coho with an adipose clip can be released unless it has been tagged.

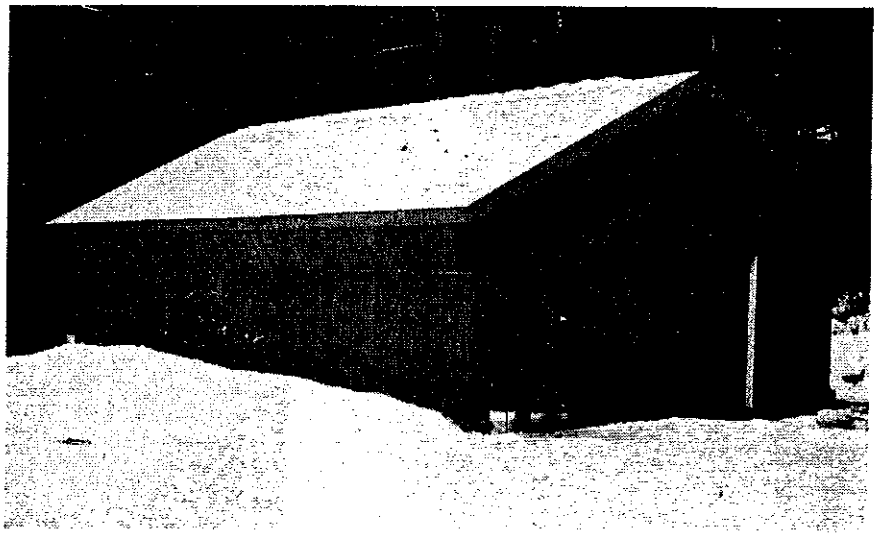


The coded wire tag which is a millimeter in length is inserted into the snout of a coho smolt. Returns from the coded wire tagged fish have greatly increased the efficiency by which results can be evaluated.

ADULT RETURNS ON COHO

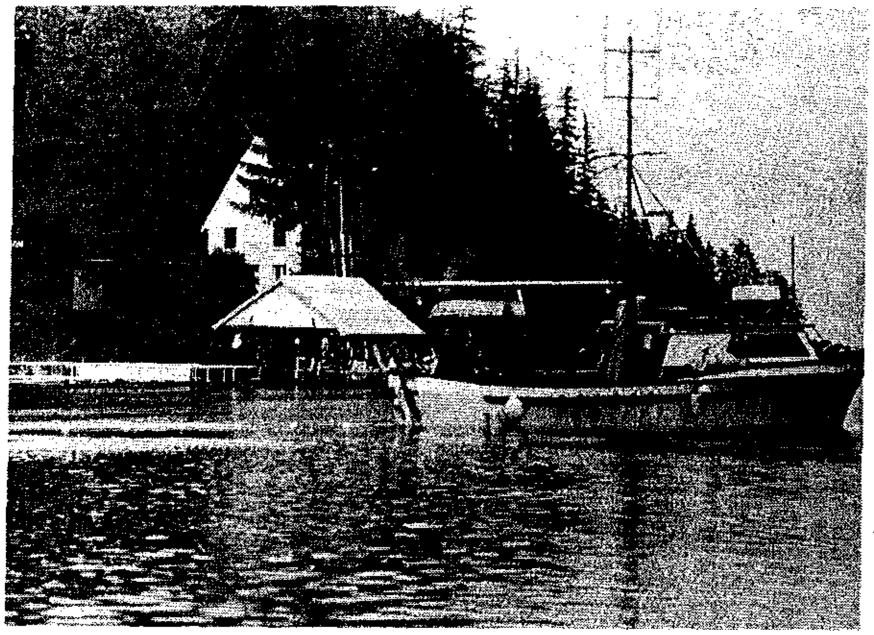
Halibut Cove Lagoon has proven successful as a short term rearing and imprinting site that can enhance the local sport fishery. Coho eggs from Kodiak were hatched, incubated, reared at Fire Lake plus smolt to post smolt reared at Halibut Cove Lagoon then released in 1974. Returns of 100 adult coho in 1975 from this release of only 7,900 smolts indicated an ocean survival of 1.3%. This percentage of return from non-indigenous fish is not unexpected since translocated fish have a poor homing ability after displacement. Those that return, therefore, have a significant importance as brood stock.

Fisheries Technician, George Carnes, holds one of 100 adult cohos that returned to Halibut Cove Lagoon in 1975.



In 1975, 350-400 adult coho returned to Starrigavan from a 1974 release of 226,603 smolts. Ocean survival of this return is calculated at 0.1%. Ocean survival at Starrigavan was lower than Halibut Cove Lagoon which probably was due to greater displacement of original stocks. A high percentage of non-Alaskan eggs was used at Starrigavan since they were all that was available when the facility began. The 1975 returns provide an important beginning for developing a local brood stock. Construction of an incubation facility at Starrigavan shown above began in the fall of 1975 and will be completed in 1976.

Little Port Walter returns were characteristic of what can be expected from estuarine husbandry. A total of 14,800 coho adults returned from a smolt release of 173,000 indicating an ocean survival of 8.4%. The success at Little Port Walter is primarily attributed to sound husbandry techniques and the use of resident stocks as brood fish rather than transplanting eggs from other locations.



N.M.F.S. Photo

Due to the large numbers of returning coho adults to Little Port Walter, a special commercial opening and an additional special contract fishery were instituted to harvest the excess adults.

N.M.F.S. photo

Over 11,000 adults were harvested by the commercial and contract fisheries at Little Port Walter.

SUMMARY OF PERCENT RETURNS OF COHO SALMON PRODUCED FROM ESTUARINE REARING, SALTWATER REARING, ESTUARINE IMPRINTING, AND LAKE STOCKING PROJECTS IN ALASKA

Brood Year	Agency	Type System	Name	Location	Numbers Produced Smolt	Numbers Produced Post Smolt	Percent Return
1968	N.M.F.S.	Estuarine Rearing	Little Port Walter	Southeastern	261 1/	-	12.2
1969	N.M.F.S.	Estuarine Rearing	Little Port Walter	Southeastern	4,000 1/	-	16.4
1971	N.M.F.S.-F.R.E.D.	Estuarine Rearing	Little Port Walter	Southeastern	7,773 1/	-	4.4
1972	N.M.F.S.-F.R.E.D.	Estuarine Rearing	Little Port Walter	Southeastern	161,065 1/	-	8.1
1972	F.R.E.D.	Estuarine Rearing	Starrigavan	Southeastern	228,000 2/	-	.2
1972	F.R.E.D.	Saltwater Rearing	Halibut Lagoon	Cook Inlet	-	7,900 2/	1.5
1972	N.M.F.S.-F.R.E.D.	Saltwater Rearing	Little Port Walter	Southeastern	-	1,946 1/	1.1
1968	Sport Fish Division	Estuarine Imprinting	Seward Lagoon	Seward	39,700 3/	-	15.2
1969	Sport Fish Division	Estuarine Imprinting	Seward Lagoon	Seward	10,900 3/	-	13.9
1970	Sport Fish Division	Estuarine Imprinting	Seward Lagoon	Seward	66,500 2/	-	5.8
1971	Sport Fish Division	Estuarine Imprinting	Seward Lagoon	Seward	30,200 1/	-	.8
1972	Sport Fish Division	Estuarine Imprinting	Seward Lagoon	Seward	100,000 2/	-	8.4
1968	N.M.F.S.	Lake Stocking	Tranquil Lake	Southeastern	6,890 3/	-	10.5
1971	N.M.F.S.	Lake Stocking	Tranquil Lake	Southeastern	2,016 3/	-	7.2
1971	N.M.F.S.-F.R.E.D.	Lake Stocking	Ludvik Lake	Southeastern	5,510 3/	-	8.4
1971	Sport Fish Division	Lake Stocking	Bear Lake	Seward	77,343 1/	-	6.5
1972	Sport Fish Division	Lake Stocking	Bear Lake	Seward	72,389 1/	-	2.4
1972	Sport Fish Division	Lake Stocking	Mendenhall	Juneau	81,425 4/	-	6.9

1/ Indigenous brood stocks. 2/ Non-indigenous brood stocks. 3/ Adjacent brood stocks 4/ Indigenous and non-indigenous brood stocks, preliminary analysis.

sockeye salmon enhancement and rehabilitation

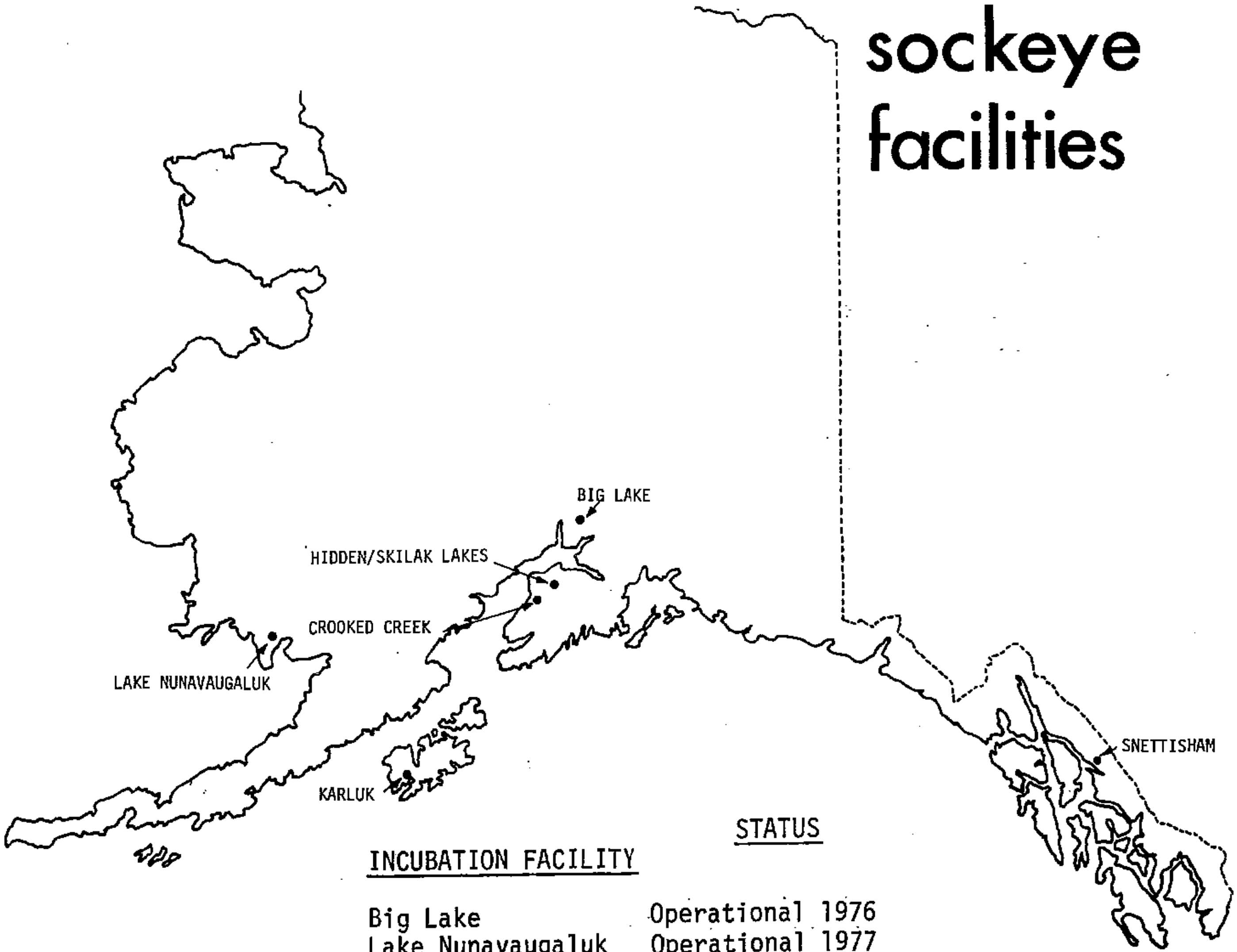
Sockeye salmon lay their eggs in the gravel of a freshwater stream or lake bed. Fry emerging from the gravel rear in a lake from one to three years and then migrate to sea as smolts. Adults return after spending one to three years in the ocean.

In Alaska there are major lakes where: (a) large scale fry deficits occur because of total absence of sockeyes, limited spawning area, or chronic poor escapements, (b) populations of predators and competitors significantly affect smolt production, and (c) the carrying capacity for sockeye fry and fingerlings is limited because of lack of sufficient basic nutrient material that governs the production of plankton.

F.R.E.D. Division's approach is to systematically develop, test, evaluate and apply production methods of sockeye enhancement and rehabilitation in a manner that will not create significant competitor or predator user conflicts or interfer with natural sockeye production.

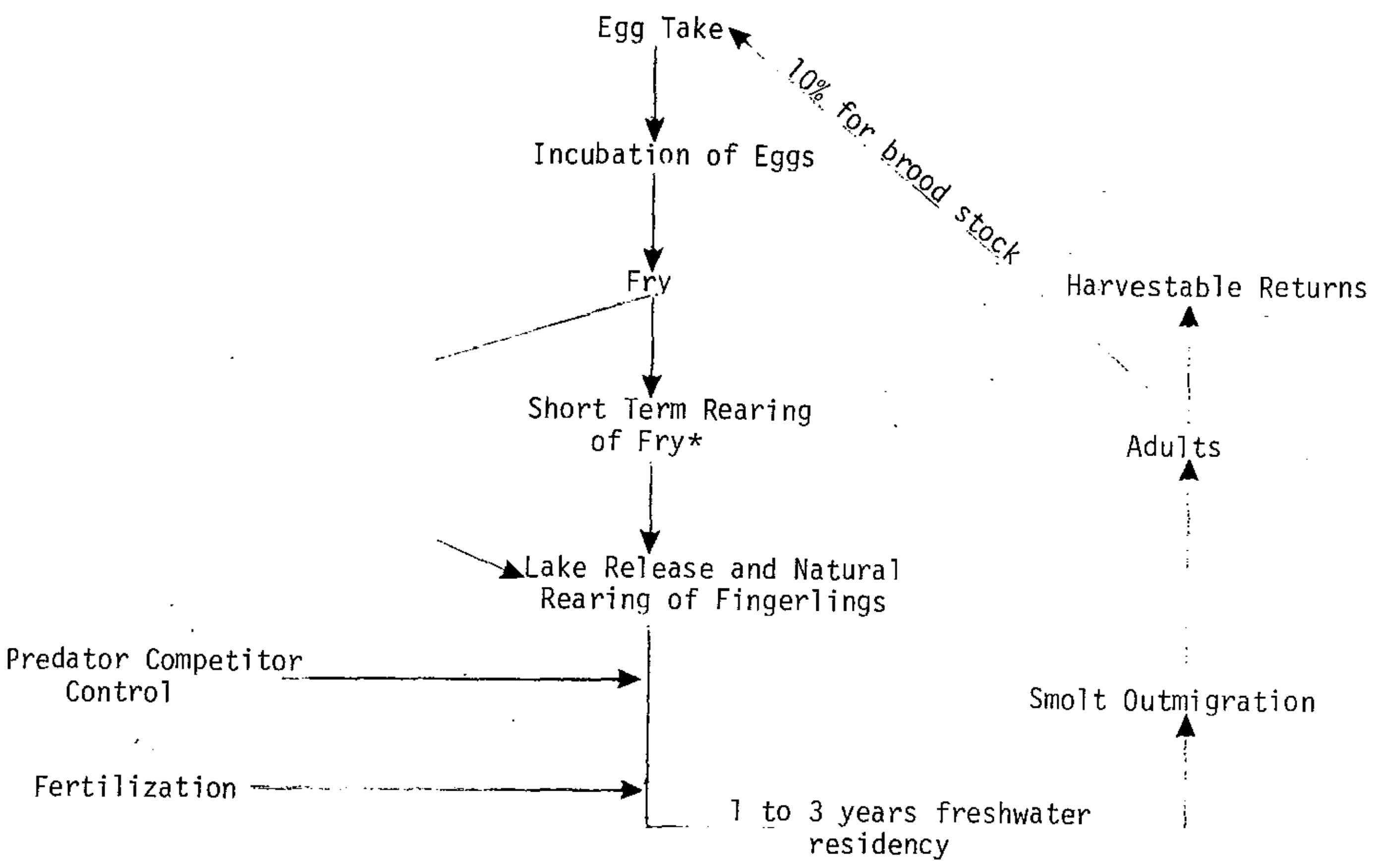
OPERATIONAL & PLANNE

sockeye facilities



INCUBATION FACILITY	STATUS
Big Lake	Operational 1976
Lake Nunavaugaluk	Operational 1977
Crooked Creek	Expanded 1975
Hidden/Skilak	Feasibility Studies
Karluk	Feasibility Studies
Snettisham	Feasibility Studies

PHASES OF SOCKEYE SALMON AQUACULTURE PROGRAM



*Short term rearing may be used to coordinate release timing with optimum lake productivity.

EGG TAKE

During 1975 approximately 8.0 million sockeye eggs were taken by F.R.E.D. Division. Over 6 million of these eggs were collected at Tustumena Lake and are being incubated at Crooked Creek. The remainder of the eggs are being incubated at Big Lake and Lake Nunavaugaluk.

SURVIVAL OF SOCKEYE EGGS TO THE FRY STAGE AT F.R.E.D. SUBSTRATE INCUBATION FACILITIES FOR BROOD YEARS 1974 & 1975

Brood Year 1974:

Facility	Location	Number of Eggs Taken	Emergent Fry	Percent Survival to Fry
Lake Nunavaugaluk	Dillingham	188,000 1/	6,118 2/	3.0
Crooked Creek	Soldotna	294,000	111,084	37.8
Totals		482,000	117,202	

1/ Modified Washington pond tray eyeing was unsuccessful with only a 6.4% survival to eyed egg.

2/ Short term reared until the fry contacted IHN and were destroyed.

Brood Year 1975:

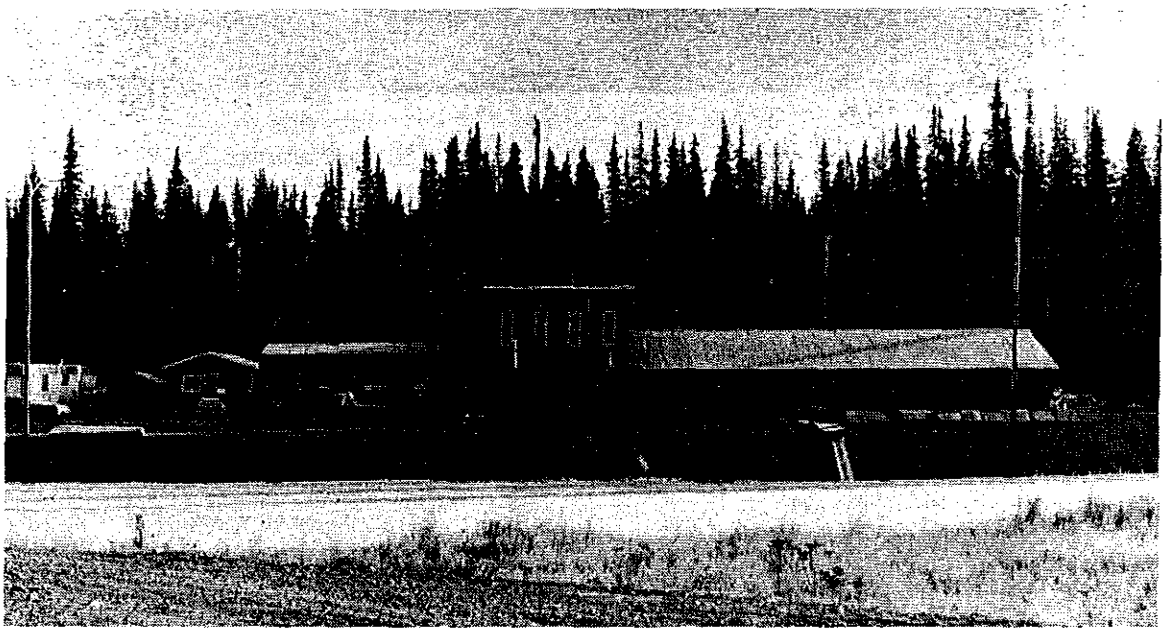
Facility	Location	Number of Eggs Taken	Projected Emergent Fry 2/	Projected Percent Survival to Fry
Lake Nunavaugaluk	Dillingham	830,773	469,156	56
Crooked Creek	Soldotna	6,366,408	1,909,922	30
Big Lake	Wasilla	180,300	126,210	70
Kitoi	Afognak Is.	297,800	208,460	70
Karluk Lake	Kodiak Is.	200,000	140,000	70
Frazer Lake	Kodiak Is.	110,000	77,000	70
Totals		7,985,281	2,930,748	

2/ Hatching is not completed. 70% survival to fry is the average survival.

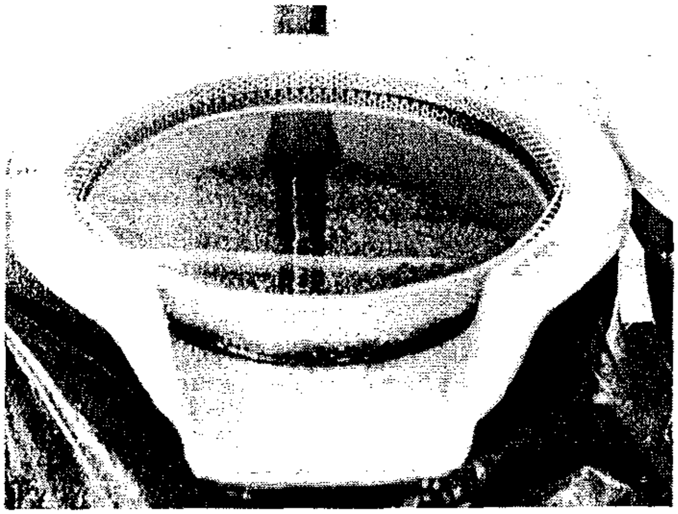
Over six million sockeye eggs were taken at Tustumena Lake August 12 to 20. These eggs were fertilized and water hardened at the weir on Glacier Flat Creek, packed in plastic bags and placed in styrofoam ice chests, then flown 35 miles to Crooked Creek for incubation. When the fry emerge, a portion will be marked and all will be released in Tustumena Lake and will naturally rear. Adult returns will be examined for marks.

INCUBATION

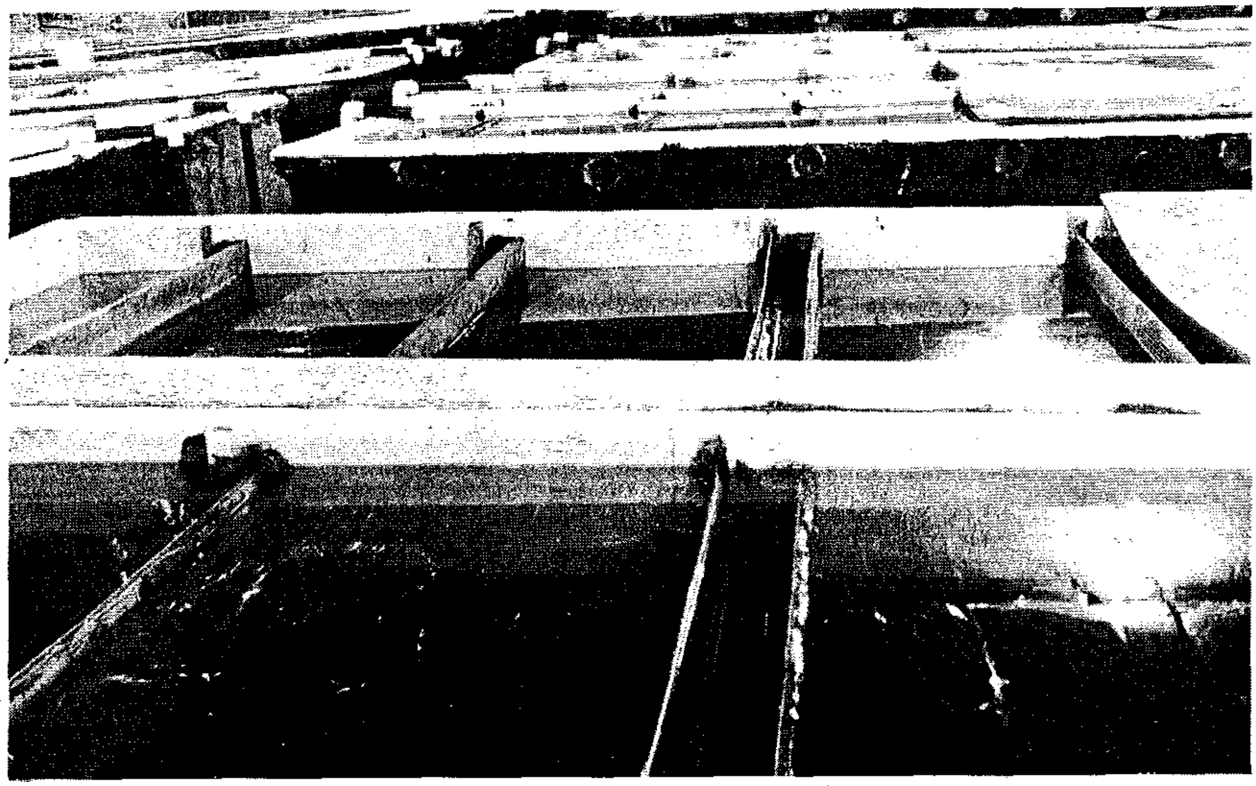
Two alternative methods of sockeye incubation are being tested in the Pacific Northwest,Canada, and Alaska. Spawning channels are being developed extensively in Canada but they would require large capital expenditures which would be prohibitive at remote sites in Alaska. Substrate technology is being developed in Alaska and preliminary artificial substrate results are favorable.



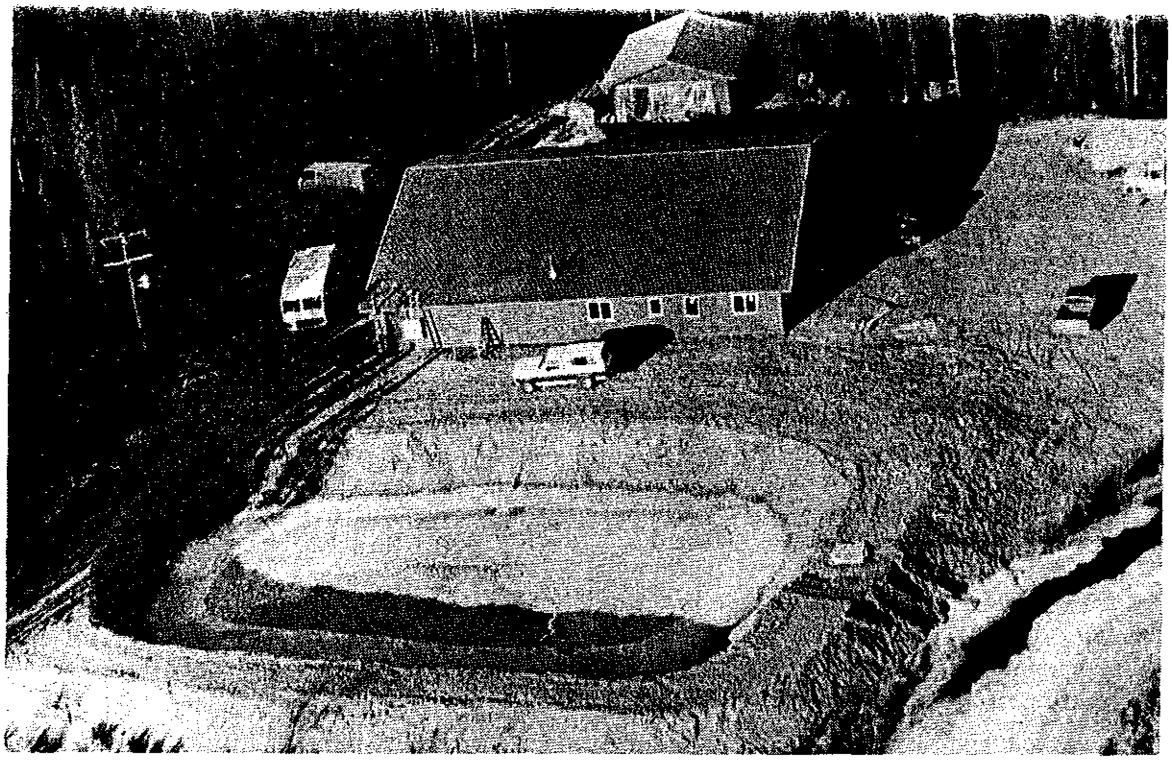
The Crooked Creek incubation facility, completed November 1, 1975, has a capacity of 10 million eggs. Initially it was designed to test outside incubation in temperatures approaching -40°. Because of the freezing problems encountered, the incubators were housed during the summer of 1975. At this facility F.R.E.D. personnel are determining the effect of sediment on survival of eggs and alevins in substrate incubators. Incubator design was changed during 1975 in an attempt to overcome a sediment problem.



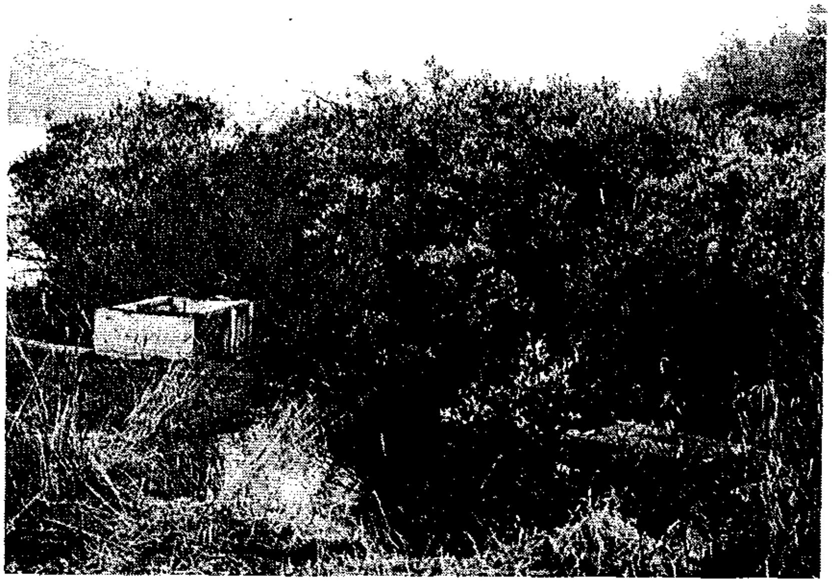
At Crooked Creek the salmon eggs are eyed in upwelling jars prior to placement in the incubators. In the majority of cases more than 95% survival to the eyed stage was obtained.



Substrate technology is being tested at Crooked Creek. Forty troughs are presently incubating 6.4 million sockeye and 3 million pink salmon eggs. Each trough is divided by baffles into 8 separate bays. At the bottom of each bay is a perforated plate that creates an even upwelling flow. Eyed eggs are seeded directly on vertical strips of Astroturf.



In November 1975 the Big Lake incubation facility at Meadow Creek was near completion. Planned production of 10 million eggs is aimed at achieving an annual return of 50,000 to 250,000 adult sockeye salmon to the Big Lake system. Facility operation will begin during 1976. A temporary incubation unit containing an initial 180,000 sockeye eggs of Meadow Creek stock has been in operation since August, 1975. This installation will provide a full year's incubation experience and insight into the system prior to initiation of production. An average green to eyed egg survival during October, 1975 was 84% in the temporary facility.



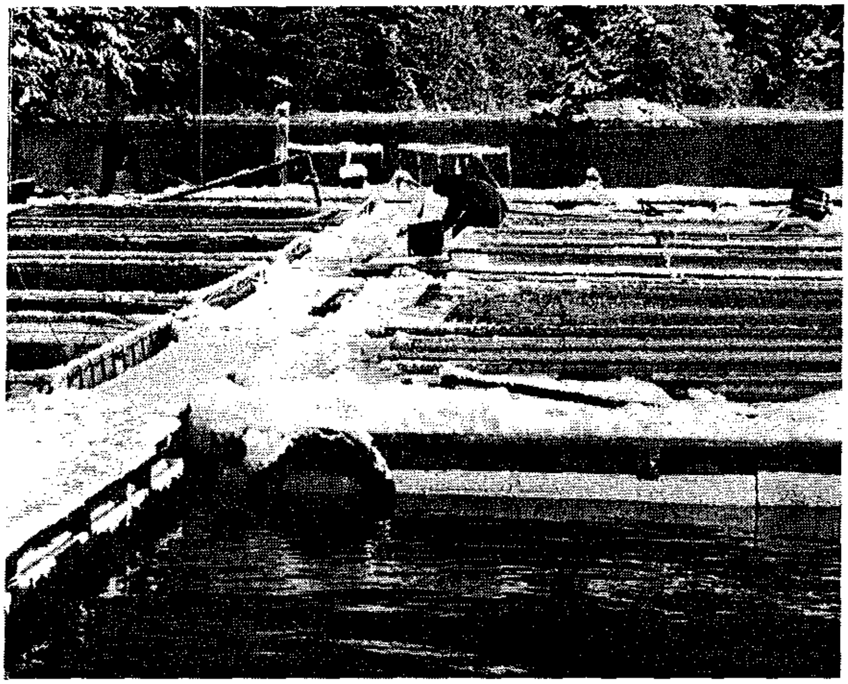
Karluk Lake has a large fry deficit and needs rehabilitation. A small pilot Astroturf incubator was installed in Lagoon Creek at Karluk Lake to test incubation technology. Incubation of 100,000 sockeye eggs in 66 square feet of Astroturf is planned during the winter of 1975-76. Emergent fry will be retained and fed in the spring water pond prior to release into Karluk Lake.

SHORT TERM REARING

The concept of short term rearing to coordinate sockeye fingerling release with optimum lake conditions is being tested. It is designed to increase lake survival from fingerling to smolt. However, this technique may be limited by IHN virus until adequate vaccination procedures are developed.

Sockeye fry that were reared last year at Lake Nunavaugaluk developed the virus and had to be destroyed.

Initial vaccine testing was initiated by Dr. Roger Grischkowsky at Kitoi and Crooked Creek in an attempt to develop control methods for the disease and consequently allow short term rearing to succeed.



Floating pens such as these will be used to short term rear sockeye fry and monitor the effecitveness of vaccine.

A number of studies to evaluate sockeye rearing systems in the Bristol Bay region were initiated by F.R.E.D. Division:

1) establishing productivity of a lake by determining food sources in the lake. Productivity studies at Lake Nunavaugaluk were done in cooperation with the National Marine Fisheries Service;

2) increasing productivity by artificial fertilization. A study at Little Togiak Lake was carried on through a contract with the University of Washington;

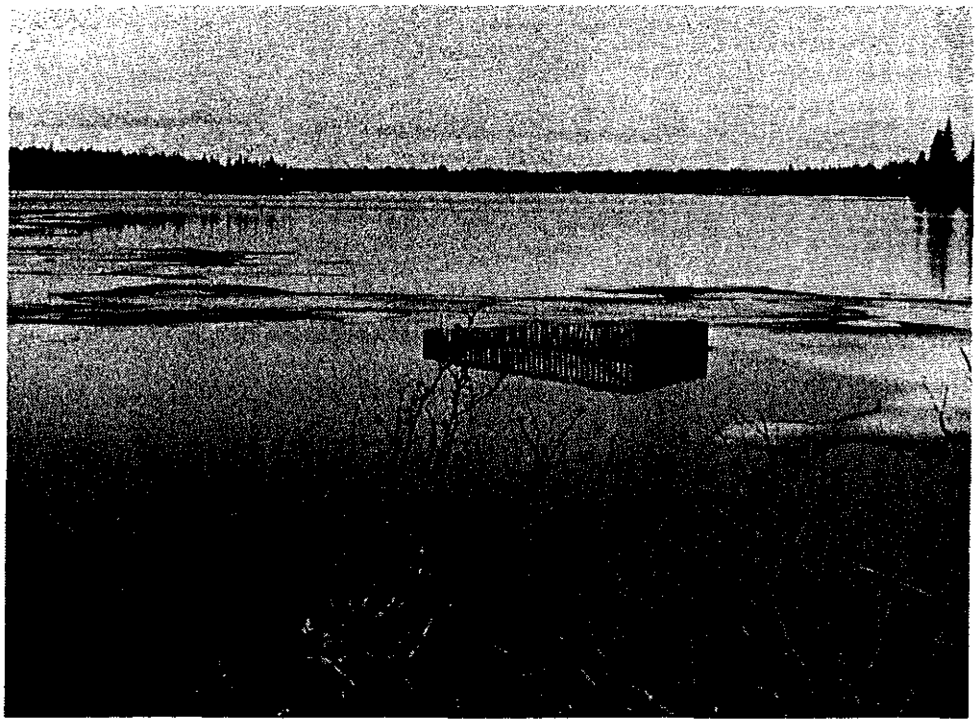
3) investigating predator-competitor problems. Dr. Craig McPhee of the University of Idaho has discovered three selective toxins which kill stickleback but not sockeye or rainbow trout. He is presently refining the dosage selection;

4) assessing char predation. A.D.F. & G. Sport Fish Division is evaluating the value of char to sporting interests and the selective control of char in lake systems.

LAKE STOCKING PROJECTS

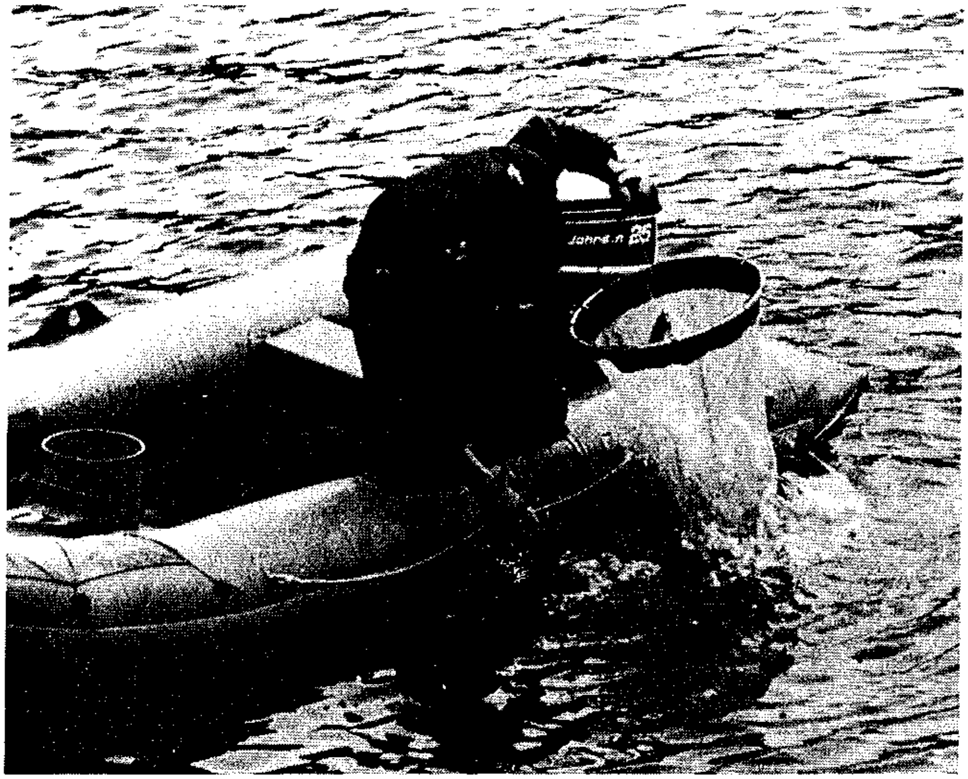
The lake stocking programs may represent the greatest sockeye rearing potential in Alaska. Throughout the state there is an undeveloped potential of natural rearing areas that can be utilized for the rearing of sockeye fingerlings to smolts. At present these areas may be inaccessible to normal salmon runs or underutilized due to poor escapement or limited spawning areas.

Much of the necessary data for a successful lake program will be developed at Lake Nunavaugaluk where detailed productivity and disease research are underway.

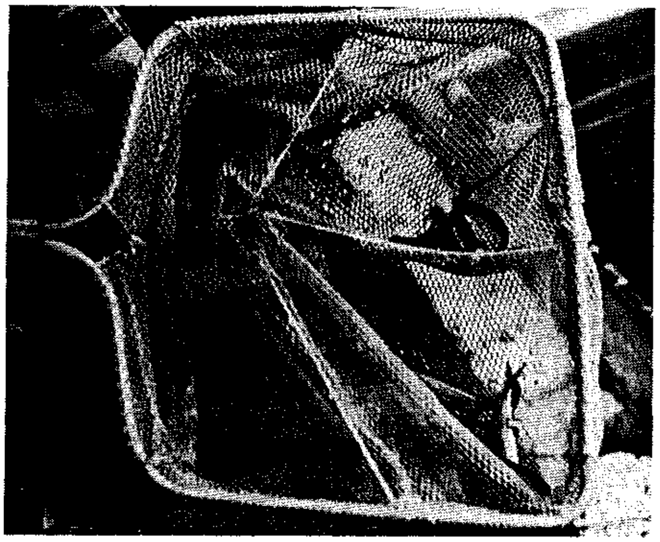


Studies are also being conducted at Packers Lake on Kalgin Island in Cook Inlet. This is a relatively small lake with a surface area of approximately 475 acres. Sockeye salmon escapement has declined markedly over the past 20 years although productivity of the lake has remained at normal levels.

The lake received an application of rotenone in the summer of 1973 to remove predators and competitors of sockeye salmon fry. 1.2 million eyed eggs were then transferred to Crooked Creek for incubation. In the early summer of 1974, 326,000 surviving fry were returned to Packers Lake.



Assessment of plankton populations are part of the lake productivity studies. Plankton tows such as the one shown in the photograph were done at Lake Nunavaugaluk to measure the amount of food available in the lake. This is used to determine the number of fry that the lake can sustain. Lake fertilization can frequently be used to increase the amount of plankton and subsequently the number of sockeye fry the lake can support.



More than 113,000 smolt were counted out of Packers Lake in the spring of 1975. A high proportion of these smolts undoubtedly originated from transplanted fry. Growing conditions during the period that the fry were rearing in the lake were exceptionally good and fry to smolt survival was calculated to be over 30%.

pathology

FISH DISEASE PREVENTION AND CONTROL

Numerous diseases have been and will be encountered in fish propagation. The success of artificial salmon propagation will depend to a great extent on the effectiveness of the disease prevention and control program.

Consequently, F.R.E.D. Division initiated the first comprehensive disease research, prevention and control program in Alaska in November of 1973. A central fish disease laboratory is maintained in Anchorage by Dr. Roger Grischkowsky, State Fisheries Pathologist. This laboratory has the capability of processing bacteriological and preliminary virological samples plus parasite detection and identification. In 1975 increased provisions for processing of tissue samples were added for viral and parasite diagnosis.

The objectives of the fish disease prevention and control program are to:

1) assist personnel in the diagnosis and treatment of existing disease problems;

2) monitor the health of fish populations in order to anticipate potential problems;

3) gather and distribute information regarding fish disease to personnel and other interested groups;

4) prevent the spread of fish diseases from one locality to another through a program of stock certification. All egg or alevin shipments are inspected and certified to be disease free.

FISH DISEASE RESEARCH

Detailed disease research has been performed on myxobacterial infections, Triaenophorus crassus, Ichthyophthirius, and Infectious Haematopoietic Necrosis Virus. A total of 74 analyses were made in 1975 including samples taken to monitor general fish health as well as samples submitted for disease identification. An additional three parasitology samples were collected.

The objectives of fish disease research program are to:

1) examine the incidence and distribution of diseases among hatchery and wild fish and shellfish in Alaska;

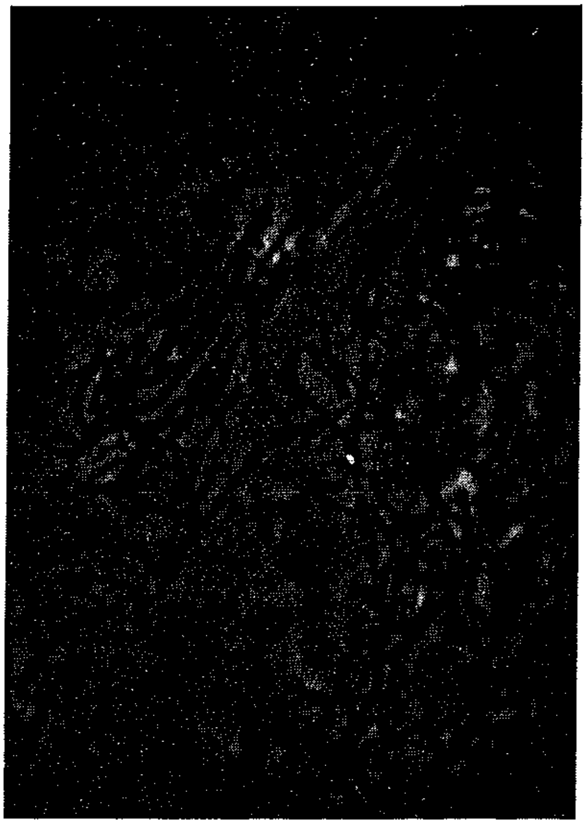
2) determine carriers and modes of infection for diseases and evaluate their influence on the survival of existing fish and shellfish stocks;

3) evaluate the interaction between hatchery and wild stocks as they relate to the spread of disease and the levels of disease resistance in both groups;

4) examine new techniques in fish culture and assess their effectiveness in disease prevention and control.

MYXOBACTERIAL INFECTIONS

The drug Gallimycin was tested for effectiveness in treating myxobacterial infections common in pen culture. Seven pens of coho salmon at the Starrigavan rearing facility were treated with therapeutic doses of this drug and their progress was compared with that of an untreated control. Results from the study of Gallimycin were inconclusive.

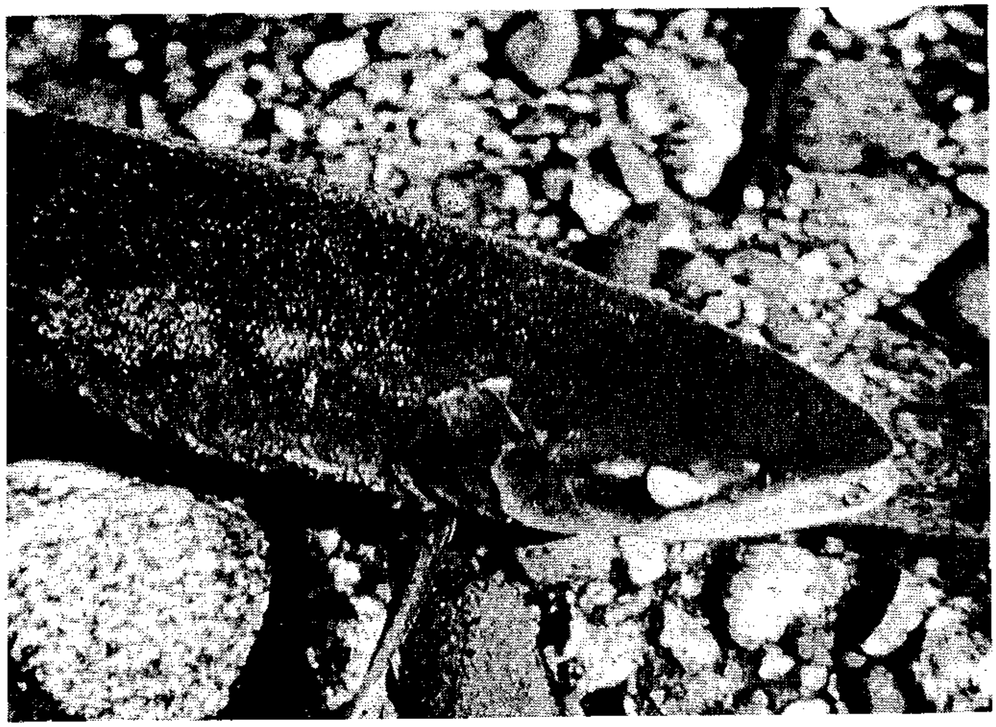


Myxobacteria caused an outbreak of Coldwater Disease at Halibut Cove Lagoon. Losses from this bacteria occur in most facilities where fish are held through the winter. Similar bacteria also are responsible for Bacterial Gill Disease.

TRIAENOPHORUS CRASSUS STUDY

An extensive survey of the occurrence of the cestode parasite T. crassus was begun in the Wood River system to assess the extent and prolonged effects of parasitism in its fish hosts, sockeye salmon, arctic char, and northern pike. Preliminary processing has revealed that arctic char are heavily parasitized by cestodes and other parasites. Assessment of the rate of infection in sockeye fry, fingerlings, and smolts, arctic char, and northern pike has not been completed.

ICHTHYOPHTHIRIUS "ICH"



A protozoa, Ichthyophthirius, characterized by a salted appearance on the skin and eye of the adult sockeye, was detected in the Big Lake system.

Nine percent of the natural sockeye production potential of the entire Big Lake system was lost due to pre-spawning mortalities resulting from "Ich". With the knowledge of its presence in the watershed, the effects of "Ich" can be maintained at low levels through proper management techniques. Measures to reduce the occurrence of "Ich" in natural spawning populations are being studied.

IHNV (Infectious Haematopoietic Necrosis Virus)

IHN virus is capable of causing almost total mortality of fry, fingerlings, and smolts of sockeye and king salmon. Ability to combat this disease may determine the relative success of sockeye enhancement efforts.

The IHNV disease control study and survey was continued to determine the distribution of the virus among populations of sockeye salmon in Alaska. As part of a cooperative agreement with the Western Fish Disease Laboratory, Seattle, Washington, several lakes were extensively sampled in order to determine the incidence of IHNV or of exposure to this virus in resident populations. In contrast to earlier years, both male and female sockeye salmon were sampled in order to obtain a more balanced estimate of conditions existing within each population.

Adult sockeye salmon were examined for the presence of IHNV in seminal and ovarian fluids at Meadow Creek (Big Lake system), Woodie Island (Illiamna Lake), Lake Nunavaugaluk, Red Lake, Frazer Lake, and Lake Nerka.

Sockeye salmon smolts were examined for the presence of IHNV and for the presence of antibodies against IHNV at Fish Creek (Big Lake system), Packers Lake, Lake Nunavaugaluk, Red Lake and Frazer Lake.

Samples from adult stickleback, sculpin, coho salmon, and arctic char were examined for the presence of IHNV and antibodies aginst IHNV in order to determine the incidence of virus in populations utilizing the same waters as sockeye smolts. Sampling sites were the same as those used for the collection of sockeye smolts.

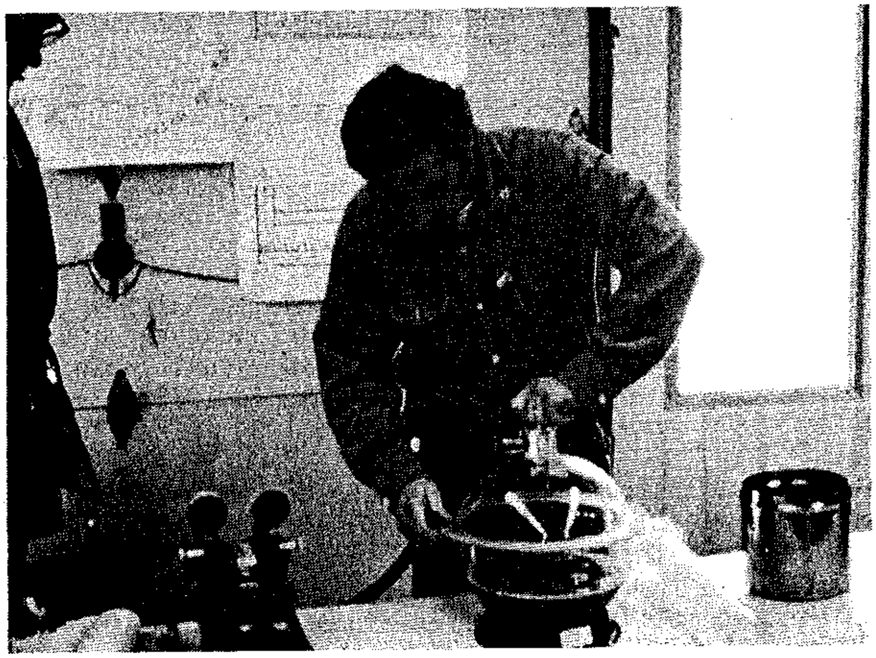
Preliminary results from the 1975 survey indicate distinctly different rates of infection existing in male and female sockeye salmon. Females consistently show a higher percentage of infected individuals than males. Processing has been completed on 9 of 19 sites examined in 1975. The range of infection rates from 0% to 45% in males and from 0% to 100% in females.

At two sites, Tustumena Lake and Lake Nerka, no virus was detected in either males or females. Five of the nine sites also were examined in 1974, and at all five sites, the percentage of infected individuals has been lower in 1975. This indicates that incidence of IHNV may be subject to cyclic fluctuation or that infected individuals suffer higher mortalities in particular years.

IHNV VACCINE DEVELOPMENT AND TESTING

In conjunction with the Western Fish Disease Laboratory, Seattle, Washington, a test vaccine has been developed.

Approximately 43,000 fry at the Crooked Creek incubation facility were vaccinated using a vacuum infiltration technique. The technique permits vaccination of sac-fry and fry which otherwise would be impossible to treat. Vaccinated and control fish were transported to the Kitoi Bay Hatchery for rearing and viral exposure.



Dr. Roger Grischkowsky vaccinates sockeye fry against IHNV using a vacuum infiltration technique.

habitat maintenance and improvement

In addition to salmon incubation and rearing, F.R.E.D. Division is engaged in other activities to enhance and rehabilitate salmon resources. Among these activities are:

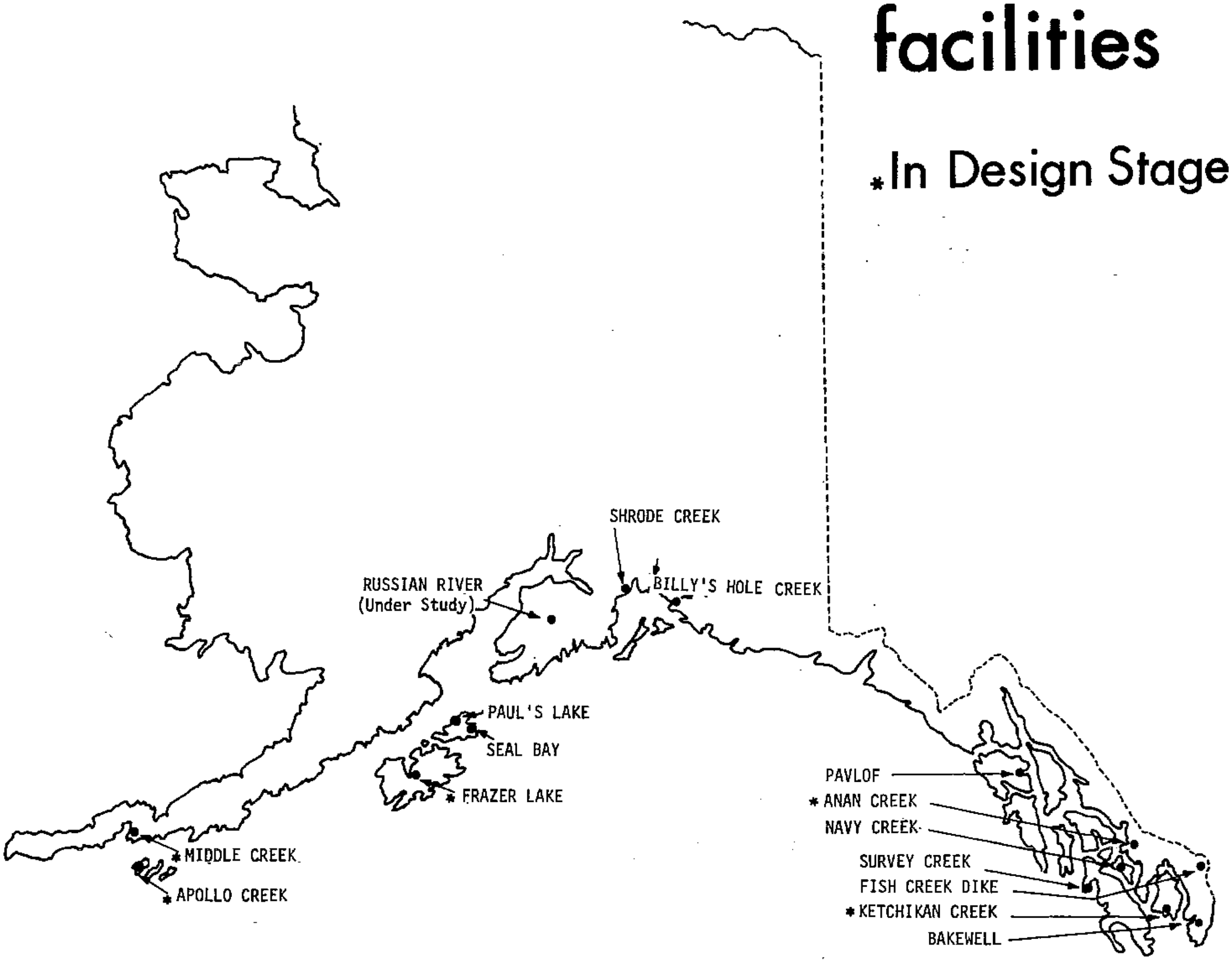
1) constructing fishpasses over migrating barriers to allow access to areas where substantial spawning area is available;

2) counteracting the dehabilitating effects of nature or man on natural spawning areas.

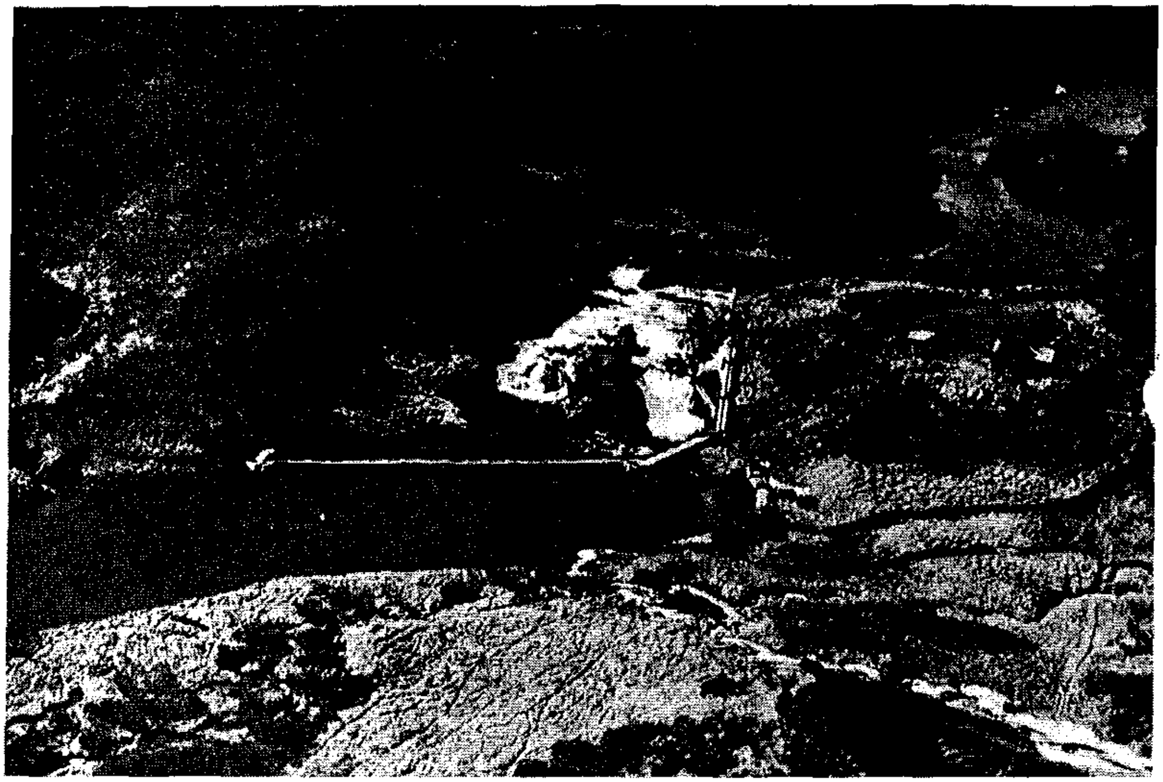
Since 1972 F.R.E.D. Division has constructed five fishpasses including this one shown at Pavlof, Southeastern Alaska, which was built in 1974. A fishpass at Navy Creek was constructed during 1975. Some of these fishpasses have been built in cooperation with the U.S. Forest Service.

fish pass facilities

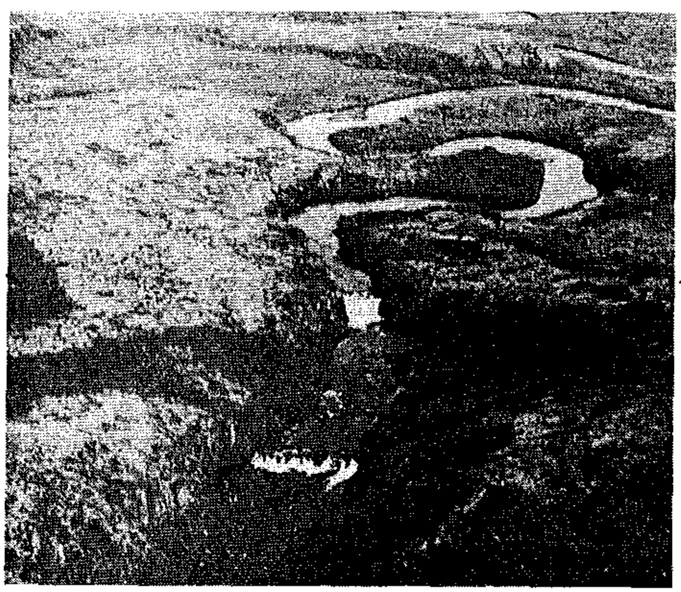
*In Design Stage



The 90-foot fishpass at Paul's Lake on Afognak Island allows sockeye, pink, and coho salmon access to Laura Lake. As presently installed, it is not effective during high water periods. In 1975, a sockeye run of approximately 25,000 adults was delayed below the pass due to a velocity block at the entrance pool. Salmon were finally able to negotiate the fishpass after temporary improvements to the structure.



The Frazer River, Kodiak Island, fishpass was improved in 1974 by extending a directional weir downstream. The 210-foot long fishpass provides access to spawning areas by king, pink, and chum salmon. An escapement of 744 sockeye was recorded between 1956 and 1960. Dramatic increases in escapement have since occurred with 325,731 sockeye counted over the fishpass between 1971 and 1975. Plans are to further expand the pass because it is reaching its capacity and the sockeye run will continue to increase.



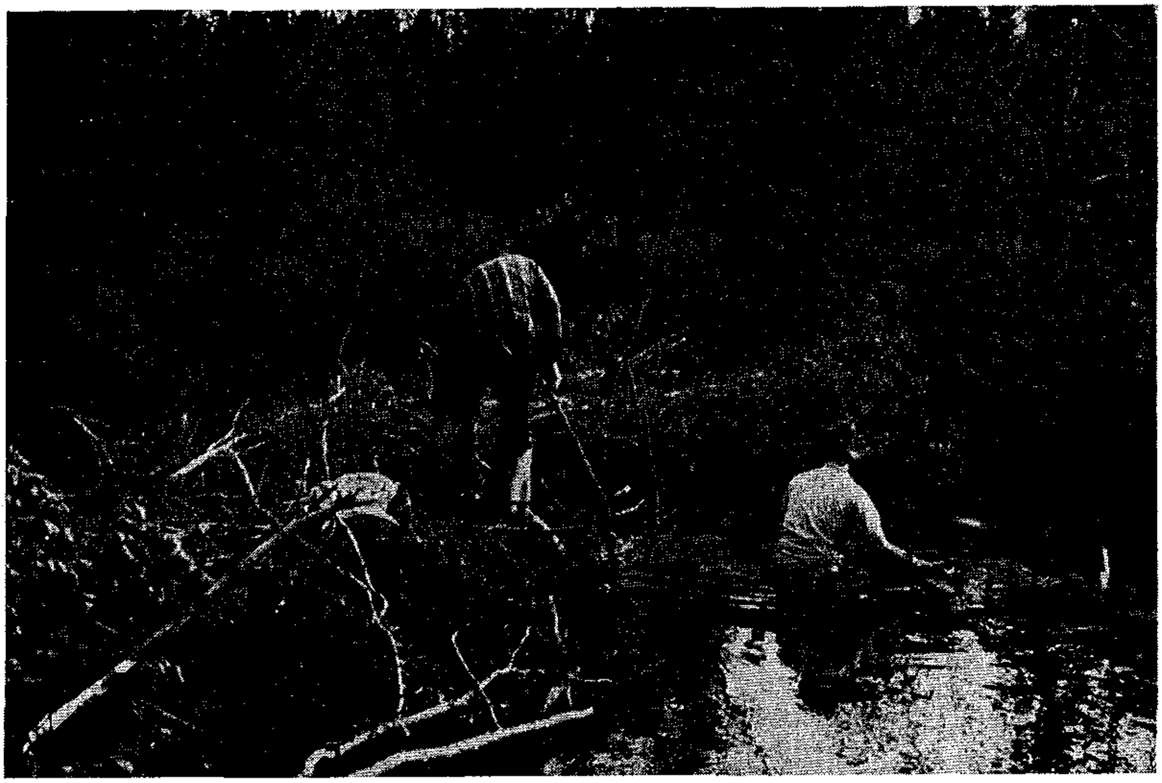
Apollo Creek, Unga Island, Alaska Peninsula, is an example of a stream where natural spawning area for pinks and chums can be increased by constructing a fishpass. Such a pass is in the design stage now that benefit/cost analysis has been performed.

Stream clearance is performed when it is determined beyond doubt that spawning and/or rearing areas are jeopardized. Indiscriminate removal of logs without understanding stream dynamics can destroy valuable spawning and rearing areas.

Glenn Creek, Southeastern Alaska, prior to debris removal.

Glenn Creek, after debris removal.

During 1975, a total of 52 beaver dams were removed or altered to allow unimpeded salmon migration in 11 Susitna River basin streams, upper Cook Inlet. Approximately 400 sockeye immediately benefited from these stream clearance activities. Aerial surveys later confirmed significant salmon migration past these altered obstructions.



At Fish Creek, Big Lake, a wooden flume was constructed through a large impassable beaver dam to allow continuous salmon migration in the event the dam is repaired by beaver.

U.S. Forest Service photo

Through the cooperative efforts of the U.S. Forest Service, F.R.E.D., National Marine Fisheries Service, and the Department of Highways, a dike was constructed to counteract the dehabilitating effects from the Salmon River at Hyder. This river was scouring the spawning beds of Fish Creek (extreme middle right) which is an important producer of unique chum salmon averaging 18 pounds.

appendix

PINK/CHUM SALMON OPERATIONAL SUBSTRATE INCUBATION SYSTEMS AND PROJECTED DEVELOPMENT THROUGH 1978.
APPROVED CAPITAL AND 1974 BOND PROJECTS AND PROPOSED CAPITAL PROJECTS FOR FY77

LOCATION	MISSION	PLANNED 1978 CAPACITY MILLIONS OF FRY	YEAR OPERATIONAL	APPROPRIATION IN THOUSANDS	EXPENDED AND ENCUMBERED 12/30/75	PROJECTED EXPENDITURES 1976-77	ESTIMATED RANGE OF ADULT RETURNS IN THOUSANDS
George Inlet (Ketchikan) Holding Facility	Research & Development	5.0	1974	100.0 (FY77 Bond Request)	95.7 -	4.3 105.0	25 - 175
Little Port Walter Baranof Island)	Research (N.M.F.S.)	1.0	1972	-	-	-	5 - 35
Auke Bay (Juneau)	Research	1.0	1971	15.0	15.0	-	5 - 35
Southeastern Incubator (1974 Bond)	Production	15.0 1/	1976-77	1010.0	5.0	1005.0	75 - 525
Prince William Sound - Site Selection Underway Capital + 74 Bond	Production	15.0 1/	1976-77	675.0	84.7	590.3	75 - 525
Tutka Lagoon Expansion FY77 (Kachemak Bay)	Production	10.0 10.0	1975 1978	550.0 (FY77 Capital Request)	510.0 -	40.0 420.0	50 - 350 50 - 350
Kitoi Bay (Afognak Island)	Research & Production	20.0	1972	385.0	23.2	150.0	100 - 700
Alaska Peninsula Site Selection Underway (1974 Bond)	Production	10.0 1/	1976-77	710.6	-	710.6	50 - 350
Interior	Feasibility	-	-	380.0 (includes Noatak)	12.0	13.0	-
East Creek (Bristol Bay)	Research	.01	1975	-	-	-	
TOTALS		87.01		3825.6	745.6	3038.2	435 - 3045

1/ Initial production sites will be selected where facilities can be expanded to 20-50 million capacity.

Note: Estimated ranges of adult returns are based upon successful operations and ocean survivals between .5 and 3.5%.

OPERATIONAL ESTUARINE AND FRESHWATER REARING SYSTEMS FOR COHO/KING SALMON AND PROJECTED DEVELOPMENT THROUGH 1978.
APPROVED CAPITAL AND 1974 BOND PROJECTS AND PROPOSED CAPITAL AND BOND PROJECTS FOR FY77.

LOCATION	MISSION	PLANNED 1978 SMOLT CAPACITY	YEAR OPERATIONAL	APPROPRIATION IN THOUSANDS	EXPENDED AND ENCUMBERED 12/30/75	PROJECTED EXPENDITURES 76 - 77	ESTIMATED RANGE OF ADULT RETURNS IN THOUSANDS
Little Port Walter (Baranof Island)	Research	Design Tests	1972	110.0	100.2	10.2	30 - 80
Starrigavan (Sitka) Upgrade	Research & Production	500.0 500.0	1972 1977	FY77 Capital Request	-	157.5	30 - 80
Fritz Cove Juneau	Research & Production	500.0	1975	200.0	195.5	4.5	30 - 80
Halibut Lagoon (Kachemak Bay)	Research & Production	400.0	1972	105.0	96.9	8.1	24 - 64
Osprey Lake & others (Baranof Island)	Research Lake Stocking	250.0(?)	1975	124.5	115.0	9.5	15 - 40(?)
Caribou Lake & others (Kenai Rear Capture Transport System)	Research Feasibility Lake Stocking	250.0(?)	1975	120.0	9.3	75.0	15 - 40(?)
S.E. King Salmon Egg Take	Brood Stock Development of Adult Returns	200.0	1975	96.2	40.2	25.0	1 - 6
Salcha-Goodpaster (Tanana)	Feasibility	-	1975	45.0	11.5	33.5 (Sport Fish Division)	
TOTALS		2600.0		800.7	568.6	323.3	145 - 390

Note: Estimated ranges are based upon establishment of indigenous brood stocks, successful operations and ocean survivals that range between 6.0% and 16.0% for coho and 0.5% and 3.0% for king salmon.

SOCKEYE SALMON OPERATIONAL SUBSTRATE INCUBATION SYSTEMS AND PROJECTED DEVELOPMENT THROUGH 1978.
APPROVED CAPITAL AND 1974 BOND PROJECTS AND PROPOSED CAPITAL AND BOND PROJECTS FOR FY77.

LOCATION	MISSION	PLANNED 1978 CAPACITY MILLIONS OF FRY	YEAR OPERATIONAL	APPROPRIATION IN THOUSANDS	EXPENDED AND ENCUMBERED 12/30/75	PROJECTED EXPENDITURES 76 - 77	ESTIMATED RANGE OF ADULT RETURNS IN THOUSANDS
Crooked Creek (Soldotna)	Research & Production	20.0	1973	595.0	442.0	153.0	100 - 500
Upgrade		20.0	FY78	(FY77 Capital Request)	-	340.0	
Big Lake (Matanuska Valley)	Research & Production	10.0	1976	529.0	242.2	286.8	50 - 250
Expansion FY77		10.0	1978	(FY77 Capital Request)	-	315.0	50 - 250
Hidden-Skilak (Kenai Peninsula)	Research & Production	20.0	1978	(FY77 Bond) (FY77 Capital)	-	2160.0 105.0	100 - 500
East Creek (Dillingham)	Research & Production	15.0	1977 EDA Grant	1743.0 360.0	1613.4	129.6 360.0	75 - 375
Karluk (Kodiak Island)	Feasibility	-	1975	55.0	11.2	43.8	
Akalura (Kodiak Island)	Adult Transplant Research	10.0 Adults Transplant	1975	216.5	66.6	60.0	
TOTALS		75.0		3498.5	2375.0	3953.7	375 - 1875

Note: Estimated ranges of adult returns are based upon successful operationa counteracting IHNV problems and freshwater rearing and ocean survivals that range between 0.5 and 2.5%.

COOPERATIVE HABITAT IMPROVEMENT AND EXTENSION PROGRAM
F.R.E.D. AND U.S. FOREST SERVICE

Project	Location	Type	Forest Service Funds in thousands	F.R.E.D. FUNDS Fish Ladder Allocation	Expended & Encumbered 12/30/75	Projected Expenditures 1976-77	Status
Tongass Forest							
Survey Creek	Southeastern	Fish Pass	92.5	.6	.6	-	Operational 1974
Pavlof	Southeastern	Fish Pass	-	49.1	47.8	1.3	Operational 1974
Navy Creek	Southeastern	Fish Pass	10.0	4.6	4.6	-	Operational 1975
Falls Creek	Southeastern	Fish Pass	10.5	9.2	8.7	.5	Operational 1976
Fish Creek	Southeastern	Dike	30.0	30.0	30.0	-	Operational 1974
Ketchikan Creek	Southeastern	Fish Pass	-	35.0	-	35.0	Operational 1976
Anan Creek	Southeastern	Fish Pass	Request Sikes Act Funds 300.0	80.8	1.0	79.8	Studies Underway
Surveys & Drafting	Southeastern	All Facilities	-	17.4	7.4	10.0	
		TOTALS	143.0	226.7	100.1	126.6	
Chugach Forest							
Control Creek	Prince William Sound	Fish Pass	20.0	25.0	39.0	6.0	Operational 1974 Modifications Required
Pauls Lake	Afognak Island	Fish Pass (modification)	-	25.0	3.7	21.4	Initial Modifications Complete
Seal Bay	Afognak Island	Fish Pass	10.0	(5.0 operational monies not included in totals)			Operational 1972
		TOTALS	30.0	50.0	42.7	27.4	

F.R.E.D. HABITAT IMPROVEMENT, MAINTENANCE, & EXTENSION PROJECTS AND FY77 REQUESTS

Project	Location	Type	Year Constructed	Authorization in thousands	Expended & Encumbered 12/30/75	Projected Expenditures 1976-77	Status
Bakewell	Southeastern	Fish Pass	1959	-	-	-	Maintain
Shrode Creek	Prince William Sound	Fish Pass	1964	-	-	-	Maintain
Billy's Hole	Prince William Sound	Fish Pass	1962	-	-	-	Maintain
Russian River	Cook Inlet	Fish Pass	-	40.0	.2	10.0	Design - Request Funds (78)
Packers Lake	Cook Inlet	Control Structure	1973	120.0	120.0	-	Maintain
Little Kitoi	Kodiak	Control Structure Repair	1960	10.0	1.2	8.8	Modifications 1975
Frazer Lake	Kodiak	Fish Pass Expansion	1963	25.0 FY77 Bond Request	25.0	- 315.0	Expansion Design Construct 77
Apollo	Alaska Peninsula	Fish Pass	-	70.0	5.0	65.0	Feasibility and Design Underway
Middle Creek	Alaska Peninsula	Fish Pass	-	100.0	5.0	95.0	Feasibility and Design Underway
		TOTALS		365.0	156.4	493.8	

CAPITAL & BOND INVENTORY, FEASIBILITY, FERTILIZATION, AND COMPETITOR-PREDATOR CONTROL PROJECTS AND PROJECTED DEVELOPMENT

Project	Location	Type	Year Operational	Responsibility	Authorization in thousands	Expended & Encumbered 10/30/75	Projected Expenditures 1976-77	Status
Water Source Inventory	Southeastern	Quality Quality	1974	F.R.E.D.	61.0	8.8 FY77 Capital Request	52.2 50.0	Continuous U.S.G.S.
Water Source Inventory	Central	Quality				FY77 Capital Request	60.0	Continuous U.S.G.S.
Snettisham	Southeastern	Feasibility	1975	F.R.E.D. U. of A.	20.0	.8	10.0	Analysis Underway
Chester Creek	Anchorage	Rehabilitation	1975	Habitat	25.0	(Habitat Section)	25.0	
Lower Jean Lake	Cook Inlet	Feasibility	1972	F.R.E.D.	35.0	27.2	7.8	Test Area for Selective Toxicant
Biological Inventory and Analysis	Bristol Bay	Enhancement Feasibility	1974 (Disaster Funds)	Comm. Fish.	220.0	226.4	-	Initial Studies Completed
Beluga Control	Bristol Bay	Sonic Scaring	1974 (Disaster Funds)	Comm. Fish.	30.0	29.6	-	Maintain
New Fisheries	Bristol Bay	Stock Assessment	1974 (Disaster Funds)	F.R.E.D.	85.0	61.6	.5	Report Forthcoming
Administration & Support - Disaster	Anchorage	Support	1974 (Disaster Funds)	Administration	22.0	20.8	-	
East Creek Incubator	Bristol Bay	Production	- (Disaster Funds)	F.R.E.D.	Reported upon in Incubation Section			
Non Committed	Bristol Bay	-	1976 (Wood River)	F.R.E.D.	58.1	-	58.1	Char Control Gear
Char & Smolt	Bristol Bay	Assessment & Control	1974 (Wood River)	Comm. Fish.	206.5	139.1	67.4	Data and Analysis Underway
Sport Fish Analysis	Bristol Bay	Effort & Utilization	1974 (Wood River)	Sport Fish U. of A.	86.5	43.2	37.3	Data and Analysis Ongoing
Fish Pathology	Bristol Bay	Effects of Parasitism	1974 (Wood River)	F.R.E.D. U. of W.	32.9	14.5	18.4	Data and Analysis Complete 1976
Lake Fertilization	Bristol Bay	Test of Fertilization	1975 (Wood River)	F.R.I.	136.0	51.0	49.0	Fertilizer Applied Monitoring
Selective Toxicant	Bristol Bay & Elsewhere	Develop & Test	1974 (Wood River)	F.R.E.D.	48.0	24.0	24.0	Three Toxicants Discovered
East Creek	Bristol Bay	Design	1977 (Wood River)	F.R.E.D.	32.0	32.0	-	Completed

SUMMARY OF APPROVED F.R.E.D. CAPITAL AND BOND EXPENDITURES AND CAPITAL AND BOND REQUEST FY77

Category	Authorization in thousands	Expended and Encumbered 12/30/75	Projected Expenditures 1976-77	Request FY77 Capital	Request FY77 Bond
Pink and Chum Salmon Substrate Incubation	3825.6	745.6	2513.2	420.0	105.0
Sockeye Salmon Substrate Incubation	3498.5	2375.4	1033.2	760.0	2160.0
King and Coho Salmon Estuarine and Freshwater Rearing Systems	800.7	568.6	165.8	157.5	
Cooperative Habitat Improvement and Extension Program U.S. Forest Service (F.R.E.D. Funds)	276.7	122.7	154.0	-	-
F.R.E.D. Habitat Improvement Maintenance and Extension Projects	365.0	156.4	178.8		315.0
Inventory, Feasibility, Fertilization, Competitor-Predator Control Projects	1098.0	679.0	349.7	110.0	-
TOTALS	9864.5	4647.7	4394.7	1447.5	2580.0

ACTUAL AND PROPOSED OPERATING EXPENDITURES BY FISCAL YEAR AND SUB ELEMENT - F.R.E.D. DIVISION

Sub Element	Major Operational Activities	Line Items	(Actual)* FY 1975	(Authorized)* FY 1976	(Proposed)* FY 1977
Anadromous	Substrate Incubation	100	702.5	1374.0	1921.5
	Estuarine-Freshwater Rearing	200	45.5	39.9	70.3
	Fish Ladder, Maintenance	300	159.4	316.9	381.6
	Stream Improvement	400	143.0	317.9	353.5
	Lake Rehabilitation	500	40.1	77.3	61.5
	Engineering				
		Subtotal	1090.4	2126.0	2788.4
Development	Development of Clam & Whitefish Resource	100	67.6	Projects returned to Division of Commercial Fisheries for management functions	
		200	1.4		
		300	15.8		
		400	6.1		
		500	3.8		
		Subtotal	94.7	-0-	-0-
Administration &Support	Admin., Planning, Supervision	100	147.9	276.8	428.6
	Clerical Support (Statewide)	200	4.4	28.8	46.7
	Fish Disease Prevention	300	4.7	21.3	49.2
	and Control Program (Statewide)	400	1.6	15.5	27.1
	Interagency Cooperative	500	1.3	4.7	5.9
	Agreements				
		Subtotal	159.9	347.1	557.5
	TOTALS FOR F.R.E.D.:		1345.0	2473.1	3345.9

*in thousands

F.R.E.D. DIVISION PERSONNEL BY PROGRAM CATEGORY, RESPONSIBILITY, LOCATION AND MAJOR FACILITIES

Headquarters Personnel

Program Category	Working Title	Classification	Responsibilities	Location	Name
Administration and Support	Director	Director	All divisional activities	Juneau	Robert Roys
"	Deputy Director	Deputy Director	All divisional activities	Juneau	Stanley Swanson
"	Staff Engineer	Civil Engineer III	Division planning, project review, engineering quality control	Juneau	Robert Lium
"	Staff Biologist	Anadromous Fish Specialist	Division planning, project review, biological quality control	Juneau	Richard Logan, PhD
"	Administrative Asst.	Administrative Asst. I	Fiscal and personnel	Juneau	Alice Wolcott
"	Secretary	Secretary I	Secretarial support to Juneau headquarters personnel	Juneau	Gail Horn
"	Chief Fish Pathologist	Fish Pathologist III	All departmental disease research, prevention and quality control	Anchorage	Roger Grischkowsky, PhD
"	Asst. Pathologist	Fish Pathologist I	Facility inspection, research diagnosis, control	Anchorage	Aloysius Didier
"	Virology Specialist	Fish Pathologist I	Diagnostic services, vaccine preparation	Anchorage	FY77 Request
"	Microbiologist	Microbiologist I	General diagnostic services	Anchorage	Raymond Ward
"	Staff Geneticist	Geneticist	Division breeding program all facilities, quality control	Anchorage	FY77 Request

Southeastern Region

Program Category	Working Title	Classification	Responsibility	Location	Name
Anadromous	Regional Supervisor Southeastern	Regional Supervisor	All regional activities	Juneau	Stanley Moberly
"	Regional Biologist	Fish Biologist IV	Regional leader for planning, site selection, evaluation and project review	Juneau	Kenneth Leon, PhD
"	Regional Fish Culturist	Regional Fish Culturist	Regional quality and production control-salmon husbandry & project review	Juneau	Hired by 2/15/76
"	Boat Officer-Maintenance	Boat Officer II	Vessel and facility maintenance	Juneau	Harold Zenger
"	Engineer 1/	Civil Engineer II	Departmental engineering	Juneau	John Truebe
Administration & Support	Clerk Typist	Clerk Typist III	Regional support fiscal and clerical	Juneau	Julia Ipock
"	Clerk Typist	Clerk Typist II	Regional support	Juneau	FY77 Request
Anadromous	Project Leader	Fish Biologist III	All projects, Northern Southeastern	To be selected	FY77 Request
"	Project Biologist	Fish Biologist I/II	Biological investigations, production & evaluation	Fritz Cove Saltwater Rearing Facility - Juneau	FY77 Request
"	Fish Culturist	Fish Culturist II	Salmon husbandry	Fritz Cove Saltwater Rearing Facility - Juneau	Elizabeth Floyd
"	Fish Culturist	Fish Culturist II	Salmon husbandry	Fritz Cove Saltwater Rearing Facility - Juneau	David Ackley

1/ Position funded by F.R.E.D. Division. Supervised by Engineering as Departmental Engineering function.

Program Category	Working Title	Classification	Responsibility	Location	Name
Anadromous	Project Biologist	Fish Biologist I/II	Biological investigations, production & evaluation	Starrigavan Estuarine Rearing Facility - Sitka	Brad Sele
"	Fish Culturist	Fish Culturist II	Salmon husbandry	Starrigavan Estuarine Rearing Facility - Sitka	Stanley Schoening
"	Fish Culturist	Fish Culturist III	Salmon husbandry	Starrigavan Estuarine Rearing Facility - Sitka	FY77 Request
Administration & Support	Clerk Typist	Clerk Typist III	Part time clerical and fiscal support	Sitka	Linda Bergdoll
Anadromous	Fish Culturist	Fish Culturist III	Salmon husbandry	1974 Bond-pink and chum incubation facility, site to be selected	FY77 Request
"	Project Leader (also project biologist George Inlet)	Fish Biologist III	All projects, Southern Southeastern	Ketchikan	Paul Novak
"	Fish Culturist	Fish Culturist II	Salmon husbandry	George Inlet incubation	Samuel Bertoni
"	Fish Culturist	Fish Culturist II	Salmon husbandry	Deer Mountain incubation	David Pospisil
"	Fish Technician	Fish Technician V	Salmon husbandry, habitat maintenance & improvement	Ketchikan	Arnold Johnson
Administration & Support	Clerk Typist	Clerk Typist III	Part time clerical and fiscal support	Ketchikan	FT77 Request

Central, Westward, Arctic, Yukon, Kuskokwim Region

Program Category	Working Title	Classification	Responsibility	Location	Name
Anadromous	Regional Supervisor	Regional Supervisor	All regional activities	Anchorage	John McMullen
"	Regional Staff Biologist	Fish Biologist IV	Regional leader, planning, site selection & evaluation, project review	Anchorage	James Novy
"	Regional Staff Fish Culturist	Regional Fish Culturist	Regional quality and production control, salmon husbandry, and project review	Anchorage	Bernie Kepshire, Ph
"	Maintenance Mechanic	Maintenance Mechanic II	Regional facility maintenance	Anchorage	Kenneth Holt
"	Maintenance Mechanic	Maintenance Mechanic	Regional facility maintenance	Anchorage	To be filled 2/15/7
"	Fish Culturist	Fish Culturist III	Regional egg take, stocking, marking and coordination, assist private hatcheries	Anchorage	David Gaither
"	Engineer 1/	Civil Engineer I	Departmental engineering	Anchorage	Paul Janke
"	Engineer 1/	Civil Engineer Asst. III	Departmental engineering	Anchorage	George Cunningham
"	Engineer 1/	Civil Engineer Asst. III	Departmental engineering	Anchorage	Bruce Arndt
"	Engineer 1/	Civil Engineer Asst. II	Departmental engineering	Anchorage	Robert Bush
"	Draftsman 1/	Draftsman II	Departmental drafting	Anchorage	Frank James
Administration & Support	Clerk Typist 2/	Clerk Typist III	Regional support, fiscal & clerical	Anchorage	June McEntire
"	Clerk Typist 2/	Clerk Typist II	Regional support, fiscal & clerical	Anchorage	Lita Lewis
"	Clerk Typist 2/	Clerk Typist II	Regional support, fiscal & clerical	Anchorage	FY77 Request

1/ Positions funded by F.R.E.D. Division. Supervised by Engineering as Departmental Engineering function.
2/ Clerical support for Pathology Program, Engineering and Regional F.R.E.D. personnel.

Program Category	Working Title	Classification	Responsibility	Location	Name
Anadromous	Project Leader	Fish Biologist III	All projects, Prince William Sound, Copper River	Cordova	Richard Nickerson
"	Project Biologist	Fish Biologist I/II	Biological investigation, production & evaluation	1974 Bond-pink/chum salmon incubation facility-site to be selected	FY77 Request
"	Fish Culturist	Fish Culturist II	Salmon husbandry	1974 Bond-pink/chum salmon incubation facility-site to be selected	Timothy Brown
Administration & Support	Clerk Typist	Clerk Typist III	Part time fiscal & clerical support	Cordova	Janice Shaw
Anadromous	Project Leader	Fish Biologist III	All projects, Southern Cook Inlet	Homer	William Arvey, PhD
"	Project Biologist	Fish Biologist I/II	Biological investigation, production & evaluation	Tutka Lagoon pink/chum incubation facility	FY77 Request
"	Fish Culturist	Fish Culturist I	Salmon husbandry	Tutka Lagoon pink/chum incubation facility	Walter Martin
"	Project Biologist	Fish Biologist I/II	Biological investigations, production & evaluation	Halibut Lagoon estuarine rearing facility	Henry Yuen
"	Fish Technician	Fish Technician IV	Salmon husbandry & maintenance	Halibut Lagoon estuarine rearing facility	George Carnes
"	Project Biologist	Fish Biologist I/II	Biological investigations, production & evaluation	Crooked Creek sockeye incubation facility - Soldotna	David Waite
"	Fish Culturist	Fish Culturist III	Salmon husbandry	Crooked Creek sockeye incubation facility - Soldotna	Bob Brookshire

Program Category	Working Title	Classification	Responsibility	Location	Name
Anadromous	Project Leader	Fish Biologist I/II	Kenai Peninsula lake-stream stocking	Soldotna	Ken Florey
"	Project Leader	Fish Biologist III	All projects Northern Cook Inlet	Anchorage	Robert Lebida
"	Project Biologist	Fish Biologist I/II	Biological investigations, production & evaluation	Big Lake sockeye incubation facility	Thomas Kron
"	Fish Culturist	Fish Culturist III	Salmon husbandry	Big Lake sockeye incubation facility	William Rosenbalm
"	Project Leader	Fish Biologist III	All projects Kodiak area	Kodiak	Roger Blackett
"	Project Biologist	Fish Biologist I/II	Biological investigations, production & evaluation	Karluk sockeye rehabilitation	Lorne White
"	Project Biologist	Fish Biologist I/II	Biological investigations, production & evaluation	Kitoi pink salmon incubation facility	FY77 Request
"	Fish Technician	Fish Technician III	Maintenance & salmon husbandry	Kitoi pink salmon incubation facility	Ronald Davis
Administration & Support	Clerk Typist	Clerk Typist III	Part time support, fiscal & clerical	Kodiak	Susan Malutin
Anadromous	Project Leader	Fish Biologist III	All projects Alaska Peninsula	1974 Bond, pink & chum salmon incubation facility to be selected	FY77 Request
"	Project Leader	Fish Biologist III	All projects Bristol Bay	Dillingham	Harold Heinkel
"	Project Biologist	Fish Biologist I/II	Biological investigations, production & evaluation	East Creek sockeye incubation facility	Rick Johnson
"	Fish Culturist	Fish Culturist III	Salmon husbandry	East Creek sockeye incubation facility	FY77 Request
"	Project Leader	Fish Biologist III	All projects Arctic, Yukon, Kuskokwim	Fairbanks, research and inventory & assessment	FY77 Request

Acknowledgements

Many people, other than Department of Fish and Game personnel, have contributed to the overall development of the F.R.E.D. program in Alaska. These contributions have been formal in the case of cooperative projects and contracts, or informal through the mediums of correspondence, seminars, discussions, and telephone conversations.

Contributions from the following people are acknowledged:

Western Fish Disease Laboratory, U.S. Fish and Wildlife Service

Dr. Donald Amend
Dr. Gary Wedemeyer

Montlake Laboratory, National Marine Fisheries Service

Dr. Fred Utter

Fisheries Research Institute

Dr. Donald Rogers

University of Idaho

Dr. Craig McPhee

Auke Bay Biological Laboratory, National Marine Fisheries Service

Dr. William Smoker
Dr. William McNeil
Dr. Michael Dahlberg
Mr. Jack Bailey
Mr. Robert Dewey
Mr. Herb Jaenicke
Mr. William Heard
Mr. Roy Martin
Mr. Fred Salter
Mr. John Helle
Mr. Gerry Taylor

U.S. Forest Service

Mr. William Sheridan
Mr. Michael Perensovich

Prince William Sound Aquaculture Corporation

Mr. Armin Koernig
Mr. Wallace Noerenberg

This report was compiled by F.R.E.D. Division personnel with the assistance of Mrs. Pat Roppel and personnel of the Information and Education Section, Mr. Russell Dixon and Dolores Moulton.